SEMINARY ROOM,
MECHANICAL ENGINEERING DEPARTMENT

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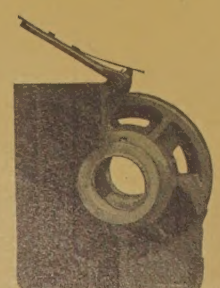
Alphabetical Index and Classified Directory fourth page following text

What Joe Learned at the Convention

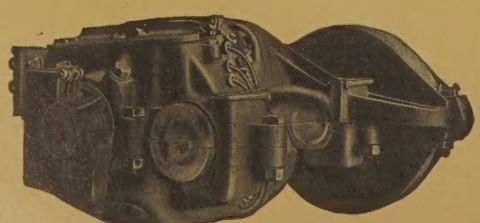
"JOE," said the General Manager to his master mechanic, "I have just been looking over your convention report and am glad to note you had such a good opportunity to get thoroughly familiar with the mechanical details of the Westinghouse commutating pole motors and HL control."

"Boss," said Joe, "you have no idea how carefully the Westinghouse Company have worked out and built every detail which goes into the construction of their motors and control. They exhibited every part, so they could be easily examined and as you say, I understand now better than ever why their motors and control are giving such exceptionally satisfactory service all over the country. Nearly all the car builders who exhibited had Westinghouse equipment on their cars."

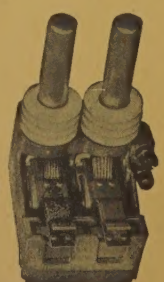
"That's a good sign," said the General Manager, "the car builders are getting wise. They like to see the best equipment on their cars."



Bearing with Separate Oil Chamber.



Westinghouse No. 306 Ry. Motor.



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Electric Railway Journal

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JOINT RATES AND THROUGH ROUTES

Steam railway companies have become gradually less hostile to the establishment of joint rates and through routes with electric lines. A number of arrangements have been made within the last year or so between the two classes of carriers. Some of these are particularly advantageous from every economic point of view. They provide greater traffic for trackage which is well able to accommodate more trains and offer increased facilities to the traveling public without extra cost. For some years the steam railways restricted joint traffic arrangements of this character in all but a few localities to carriers operated by the same motive power, and efforts of electric lines to effect changes in this general policy were usually unsuccessful. Lately, however, this attitude has been modified, and in a number of instances joint rates and through routes are in force to the advantage of both electric and steam carriers. Such arrangements are not confined by any means to the "weak" steam roads; strong roads are parties to the tariffs in several conspicuous instances. Interchange arrangements are desirable where they enlarge the use of existing track and terminal facilities and serve the public convenience.

BERLIN TRANSPORTATION PROBLEMS

Like other large cities of the world, Berlin is seeking a solution for its rapid transit problems, and important developments in that city may be expected as a result of the investigation which is now being conducted by the municipality. In some respects Berlin is more fortunate than most of the other large European capitals, because it is largely a modern city in its design and growth. One hundred years ago Berlin had a population of less than 200,000, so that its present population of about 2,500,000 equals a compounded yearly growth of about 2.5 per cent. The rapid rate of this increase dates really from the Franco-Prussian War and the establishment of Berlin as the capital of the new German Empire. Hence the streets, except in a small section of the city, are wide, and there are many arterial highways. But the city's rapid transit system was not laid out with the same forethought for future needs. The Stadtbahn, which is really a connecting railway through the center of the city of the steam railroads which enter it from different sides, can at present hardly be considered as a great assistance to local communication, and the elevated and underground railway has already reached its capacity. This latter road, through singular shortsightedness, was constructed as a double-track line only, so that with its frequent local stops it does not furnish the rapid transit which is needed. The surface railway system, all in the control of one company, is managed with notable efficiency and ability, but is necessarily subject to the limitations which surround all surface systems. In the meantime the rides per inhabitant of the German capital are increasing, and the municipality, as well as the Prussian and imperial governments, realizes the necessity of the adoption

of broad plans to cope with the future. The electrification of the Stadtbahn is one of the means proposed. A traffic expert has recently been appointed, and Berlin, like New York, seems destined to enter upon a study of traffic conditions which will prove of interest not only to the residents of that city but to those of other communities as well.

INCREASED SEATING CAPACITY

The introduction of the center-entrance car has apparently dissipated the generally existing belief that the front platform should be reserved entirely for the motorman. It is, of course, true that on a good many of the prepayment types of car a seat on one side of the open front platform has been provided. Yet no very consistent effort has been made to train the passengers to make use of all of this space. The result is that there are a great many cars in the country to-day being operated with a capacity somewhere between 5 per cent and 10 per cent less than what might be obtained. It may be that it is necessary to separate the motorman from the passengers, although there does not appear to be any difficulty in the case of several types of center-entrance cars where nothing is provided other than a curtain to protect the motorman from the glare of the lights at night. However, by inclosing the motorman in a small compartment at the end of the car, which can be, if desired, made to fold up when the direction of the car is reversed, the motorman can be isolated and the space available on the front platform can be utilized. With single-ended cars this motorman's compartment may, of course, be made stationary. An increase of 5 per cent in the capacity of the car means in the end a decrease of nearly 5 per cent in operating costs, and when this saving can be obtained as cheaply as it can be by installing a motorman's compartment or by overcoming an ancient prejudice it would seem to be well worthy of a trial.

WATCHING THE CONTRACTORS' METHODS

The importance of reducing labor costs on construction jobs handled by street railways on the day basis warrants a careful study of field methods by progressive department heads responsible for the use of men and materials on such work. It is not always realized how much can be learned along this line from contractors engaged in erection of buildings, excavation for water and sewerage work, highway maintenance and other outside jobs handled on a large scale, and it will often pay the street railway man to visit work of this character where heavy materials in bulk and a high degree of specialization of labor are important features. The average contractor who is successful holds his place in business to no small extent by the adoption of labor-saving methods. Hence a critical examination of the means employed for disposing of material, the machines used instead of hand labor and his use of gravity and overhead hoists on a big building job or in the reconstruction of a long street ought to be thoroughly suggestive to the man who faces an important piece of carhouse extension work or a renovation of 2000 ft. or 3000 ft. of roadbed and track. Long observation of such work emphasizes the need of cutting time and distance to the limit in handling materials and preparing the work for completion, and it opens one's eyes to the economies of portable motor-driven tools, intensified illumination of the field of work and the possibilities of saving labor by the use of the field telephone and by a close organization of the force.

FLUCTUATIONS IN REPAIR SHOP WORK

In the past, when the equipment of every electric railway in the country consisted of closed as well as open cars, it was a practical impossibility to maintain an even amount of work throughout the year in the repair shop. Now, however, the introduction of the prepayment idea and the steady increase in the use of convertible cars, with the tendency toward the elimination of the open-bench type, afford an opportunity to equalize repair work over the entire year. This permits the utilization of one of the most important factors in turning out repair work in an economical manner. No shop which is worked beyond its capacity for a part of the year and then is obliged to run with a very greatly reduced force for the rest of the time can be organized in a really satisfactory way. The best workmen will not accept the indefinite employment which is thus offered, and the certainty that the force is to be reduced puts a premium upon what is called in England "ca' canny" or in some parts of this country "stretching the job." Neither the workman nor those in charge of the shop operations can be blamed for such a condition so long as work cannot be arranged in a reasonably steady routine. In fact, until repair shops are placed upon the basis of an approximately constant supply of work the year around, with the certainty of permanent employment to the large majority of the workmen, it is useless to expect from them costs which are even approximately as low as those obtained in manufacturing establishments.

THE ONE-MAN CAR IN LARGE CITIES

Neither the excellent paper by S. R. Inch on "One-Man Prepayment Car Operation" nor the discussion thereon at the Chicago convention touched upon the possible field of this car on the light-traffic lines of medium-size or even large cities. There are many urban systems where, for one reason or another, the tide of travel is far below that of the main arteries of street railway transportation. Thus, even a densely populated section like the borough of Manhattan, New York, has a number of short crosstown or stub lines, operated either by storage batteries or horses, which do not earn as much per mile as the average railway in a ten-car town. This condition is paralleled in other longitudinal cities where many of the crosstown routes are of relatively little importance. Again, the system seems very suitable for night cars in large cities. A still greater number of opportunities for the exploitation of one-man cars appear to exist on the suburban extensions of city lines. In many of the cases where shuttle cars are operated through new suburbs the conductor has no other duties in the home-coming hours than to take up transfers and to watch passengers alight. It is true that he does have to collect fares and issue transfers during the town-going hours, but even then his duties are light because of the small amount of travel. Before a company enters upon one-man

operation, however, it is essential that the cars be equipped with every practicable device which will decrease the duties of the motorman-conductor. As a motorman, he should be furnished with power brakes to minimize his physical labor, and, as a conductor, he should have fare-recording devices that will avoid the mental effort and time required to make out a trip sheet. A push-button circuit should, of course, be also installed for the convenience of the passengers. Should a railway buy specially designed cars, they could always be transferred to later extensions as soon as the traffic had outgrown the limitations of one-man service. Still, a new car is not a necessity if the company has some small cars with reasonably long vestibuled platforms which can be readily converted for one-man operation without impairing their possible return to two-man service. The great improvements which have already been made in prepayment car equipment and operation seem ample to meet the service conditions hereinbefore outlined. It is obvious that operation with the right kind of one-man rolling stock can produce a great saving and hence widens the possibilities of profitable operation.

STANDARDIZATION OF MACHINE TOOL OPERATION

The *Engineer* of London recently described a method of standardization for machine tools which is so valuable and so simple that it is somewhat extraordinary that it has not been placed generally in service long before this. The method consists in attaching permanently to each machine tool a card showing the spindle or traverse speeds obtained with any position of the belts, if the machine is belt-driven, or with any combination of the control levers in case the machine is furnished with a geared head. In the former case each step of the cone is numbered, and additional indication is given for back-geared speeds when the back gears are in mesh. With geared head machines, a simple diagrammatical illustration of the control levers is shown and the various positions of these levers are indicated by letters. The combinations of positions are shown on the card by corresponding combinations of letters. In the case of boring mills or lathes using regularly the same grade of high-speed steel, the proper peripheral or cutting speeds for the various kinds of material determine positively the speed at which the machine will run for any given diameter of work.

On this basis the card which is attached to the machine gives, in addition to the list of cone steps or the illustration of the control levers, a list of diameters for work and three or four columns of letters and numbers indicating proper speeds of the machine for different metals, such as mild steel, cast steel, cast iron and brass. The normal cut and feed which the machine is capable of carrying at the peripheral speeds given in the table are then added at the bottom of the columns, and where the work done by the machine covers a very wide range a number of different combinations can be provided for and indicated by letter, the letter appearing in the column with the indication for the machine speed. In the case of drilling machines the possibility for different combinations of cut and feed naturally does not exist. For this reason the drill diameter and the proper speed indication for the different metals is all the information that has to appear on the card.

It should be remembered that the average machinist has no actual conception of cutting speeds and has to depend absolutely on his experience, combined with a rough guess as to rotative speed, in order to get the best results out of a machine. In many cases this past experience leads to faulty conclusions, and naturally where either the man or the machine is new in a shop the whole question of operation is absolutely devoid of any logical basis. The application of cards which enable a machine operator to establish at once the proper speed furnishes a most satisfactory means for overcoming this difficulty, and it is safe to say that there are few machine shops engaged in general work which would not be benefited by their introduction.

CO-OPERATIVE BUYING FOR EMPLOYEES

The report that The Milwaukee Electric Railway & Light Company has been conducting an inquiry among its employees into the cost of living, with the ultimate aim of evolving some co-operative plan which will be of general benefit to the men, is another step forward along the line of what appears to many people to be an inevitable course. Co-operative buying is one of the most logical means for the elimination of the profit of the middlemen, and with the steadily increasing cost of living it would seem inevitable that purchasing individually through a retailer would be superseded wherever possible by making use of the economic advantages of the buying power of a large number of individuals banded together. Street railway employees in cities are peculiarly subject to the influence of the middleman as well as to the difficulties of distribution of the necessities of life, as they are required almost invariably to live within the congested or partly congested sections and in consequence are obliged to pay extravagant prices for everything they buy. Acting together as a single unit, their purchasing power becomes enormous, and when this is organized and properly directed it is easily possible for the employees to make very great savings in the cost of their living.

There are, of course, many different ways in which this buying power can be used, the possibilities extending all the way from the simplest scheme, where special reductions in price are made to employees in certain stores in return for the advantages which should accrue from the increased trade, to the actual formation of a co-operative society employing expert buyers and purchasing direct from the producer in large amounts. The difficulties in the way of such schemes as the latter may perhaps appear almost prohibitive, and they would undoubtedly involve a considerable effort and some expense and risk on the part of the employer. However, the advantages which are to be gained by any of the methods are so great that they will undoubtedly repay their originators in the long run. In fact, any means whereby employment is made pecuniarily attractive has a value actually greater than when expressed in terms of wages. One of the features of the introduction of any such scheme, however, is the fact that the opposition of many of the employees themselves will have to be overcome. The so-called "company store" in the past has often been the means of outrageous abuse, and suspicion on the

part of employees regarding any similar scheme cannot be considered entirely unreasonable. But past abuses have occurred principally at company stores in mining camps and in small towns where the store has held practically the monopoly of the retail business, and in a large city, where the prices in the company store can readily be compared with those outside and no suggestion of compulsion is used, it should not be difficult to overcome a large part of this opposition. Certainly the opportunities for success are so broad that the results of the experiment at Milwaukee will be watched with interest, and we should not be surprised if other companies were to enter this field of practical welfare work.

TRAFFIC COUNTS

A characteristic development of the last six or seven years is the systematic analyses which have been made of the movements of traffic in different large cities in this country. The first important study of this kind with which we are acquainted was made on one of the roads in Chicago a year or two previous to the passage of the 1907 ordinance and the rehabilitation of the surface lines in that city. Prior to this time, however, extensive studies had been made by this paper of the rides per capita in different cities, the movements of cars on the main arteries of travel and the distribution of population as shown by spot diagrams, and more or less extensive articles were published embodying this information for New York City, Buffalo, Philadelphia, St. Louis and Metropolitan Boston. This work and that undertaken under the stress of reorganization in Chicago have been followed, however, during the past five years by much more elaborate studies, conducted both by the companies themselves and under municipal direction, to determine scientifically the best means of supplying rapid transit to different localities, and there are now comparatively few cities in the country of more than 250,000 inhabitants where there has not been some such investigation.

The policy of carefully studying the situation first and then acting is far better than the old plan of making haphazard extensions or of changing routes without consideration of the effect of such changes upon the operation of the railway system as a whole. It has been brought about by the growing conviction that the prosperity of a community is very dependent upon the proper development of its local railway system and that, in city transportation, arrangements once satisfactory are very apt to become inadequate through the lapse of a few years. The fact is that the methods of routing employed in a great many cities are not the result of a study of the transportation conditions, but are often extremely arbitrary. They had their origin in long-past consolidations of different transportation companies and are continued partly because of the difficulty of overcoming local prejudice against any changes in a route and partly because of the difficulty of departing greatly from the right-of-way laid down in the company's franchise.

The foundation for any comprehensive study of the transportation needs of a community is, of course, a determination of what are the natural arteries of traffic and the direction and extent of the flow of such traffic at present. The basis for this determination is the traffic count. It is the only means of exposing existing conditions and will supply a basis upon which the needs of the future can be predicated. For this reason the account of the methods being followed to determine the amount and direction of the existing traffic on the surface lines of the Philadelphia Rapid Transit, published elsewhere in this issue, will be of especial interest because in some respects the count is more elaborate, so far as we know, than any which has been conducted elsewhere. As a rule, the plan followed in the past has been to confine the information of this sort to a count of the actual number of passengers passing given points, or the number on and off in different sections of the city. In Philadelphia the purpose is to obtain not only this information but also the actual destination of each passenger counted, and as the city has been divided for the purpose of this census into a large number of "traffic sections," a very accurate idea can be had of the daily movement of the population and the routes patronized. This count is an amplification of that conducted in the same city two years ago by Ford, Bacon & Davis for the Railroad Commission of Pennsylvania. This count was probably the most extensive conducted up to that time in any city, and the results obtained from the present tabulation as compared with the one of two years ago should be most instructive.

Philadelphia, like many other large cities, and to a greater extent than perhaps many cities, has a large number of centers to and from which the tide of traffic flows and ebbs daily. In this respect it bears a striking resemblance to London, to which topographically the city is not dissimilar. That is to say, both are located upon practically level ground with only slight natural impediments in the way of bodies of water to a distribution of population within the metropolitan area in practically every direction. In Philadelphia this condition has resulted in the development of a number of manufacturing and retail sections which, to a considerable extent, are independent of each other so far as transportation facilities are concerned.

Of course, a complete study of transportation conditions in a city cannot be based purely on a traffic count, although that is the most essential factor in arriving at a final solution. The means of transportation have also an important bearing, because those in existence may have developed one section of the city abnormally as compared with another, and a change in the facilities may effect a radical alteration in population. All of these questions must be determined, of course, more or less definitely, before a solution can be reached.

Philadelphia is not the only city in this country in which elaborate investigations of traffic conditions are being conducted or have recently been made. Also in this issue, we publish an abstract of a study of the traffic conditions in Cincinnati. Perhaps Cincinnati is as conspicuous an example as could be had of the slight conception held by those who founded most of our cities of the possibilities of their development and the conditions of modern city life. According to the report, Cincinnati was originally expected not to grow beyond the confines of the flat land upon which it was established, and the natural barrier of hills which surrounds it, as in Pittsburgh, has greatly complicated the transportation problem by confining easy egress from the

business sections of the city to a few valleys. The subject of the rate of car loading as developed in Cincinnati on different types of cars is a feature of this report.

Other cities in which extensive investigations of traffic conditions have been conducted within the past year or so have been San Francisco, Pittsburgh, Providence, Los Angeles and New York City. Accounts of these investigations have been published in this paper, and important programs of improvements based on them have been adopted or are in process of construction. The work is calling into existence a new type of investigator whose responsibilities are no less serious than those of any other engineer. We say engineer because the principles underlying this work are those of engineering. At the same time the city traffic expert must be more than engineer; he must have a knowledge of street railway finances and accounts, an acquaintance with transportation conditions and the principles of city planning and the ability to predict from existing data the directions of growth of the community, and upon the correctness of his analysis rest the safety of the investment of large sums of money and the comfort of a great many people.

COSTS OF ACCIDENTS ON STREET LEVEL AND OTHER LEVEL RAILWAYS

Statistics of the cost of injuries and damages on the surface, elevated and subway lines controlled by the Interborough-Metropolitan Company in New York show some interesting variations which arise from the different degrees of risk involved in the operation respectively of rapid transit and street level railways. The relatively low ratio of expense on the subway and elevated lines for this part of the cost of operation is regarded as a matter for proper comment in the annual report of the Interborough Rapid Transit Company. While no similar particular mention is made in the annual report of the New York Railways Company regarding this feature of the operation, the elements of operating expenses are so presented that the complete figures of cost are available. The annual report for the Interborough company apparently gives the actual expenditures, while the New York Railways report shows both the amounts actually expended and those held in reserve for the liability of the period. The amount of cases affecting the Interborough company pending on appeal at the end of the fiscal year, however, was very small and may be disregarded at this time.

The figures given for the Interborough company relate to the fiscal year ended June 30, 1912, while those of the New York Railways cover the first fiscal period of that property, the six months ended on the same day. Disbursements made by the Interborough company in payment of claims, suits and judgments and expenses of the legal and claim departments reached an aggregate for the year of 1.31 per cent of gross operating revenue. The amount actually expended by the New York Railways for injuries to persons and property in the six months was equal to 2.3 per cent of the passenger revenue, while the reserve charge for this item was equivalent to 5.7 per cent, making a total expenditure and reserve of 8 per cent of the passenger revenue. The amount is equal to 7.7 per cent of the total revenue from street railway operations, which compares more exactly with the gross operating revenue on which the Interborough percentage was calculated. The total charge on this account by the New York Railways was equal to 12.7 per cent of the entire operating expenses.

Some of the differences in the units which have a general bearing on these results are not so great as might be expected. For instance, the total number of miles of track of the Interborough system, subway and elevated combined, is 203.36 as compared with 164.913 for the New York Railways. If we calculate the numbers of cars per mile of track, they stand about as follows: New York Railways, electric passenger and service cars, 15.6 per electric track mile; horse passenger and service cars, 10.8 per horse track mile; total cars, 14.7 per total track mile. Interborough system, subway passenger and service cars, 13.9 per subway track mile; elevated passenger and service cars, 15.6 per elevated track mile; total cars, 14.9 per total track mile. As these averages relate to the cars owned, they do not make any allowance for the open cars which represent roughly the number of cars that are in service for only part of the year. Taking out the open cars, the average stands 14.7 cars per mile of track for the Interborough system and 11.4 for the New York Railways. As the elevated and subway cars are operated in trains, the number of units operated is less for these properties per mile of track than for the New York Railways, where the unit is one car; the risk is also less.

The number of revenue passengers per mile of track carried by the Interborough lines in the year approximates 2,980,000. No calculation is made for the large number of bodily transfers between express and local trains. The average of revenue passengers per mile of track on the New York Railways system was approximately 790,000 during the period of six months, or say 1,580,000 average for the year. This, of course, makes no allowance for the large number of transfer passengers, which is in the neighborhood of 40 per cent of the revenue traffic. If, however, none of the bodily transfers on the subway lines is to be regarded as a separate passenger movement, it is not consistent to take into account the full extent of the transfer traffic on surface cars. The average numbers of fares received per mile of track, which is what the calculations really give, may be a little misleading as to the total volume of traffic involved unless the fact is borne in mind that the average haul on a large amount of business is greater on the rapid transit lines than on the surface property.

The figures given as to the cost of this unfortunate element of expense probably represents, with reasonable approximation, the relative expenditures under the existing conditions for lines operated on the surface and on other than the surface levels. Neither the speed of operation nor the personnel of the transportation force is so great a factor as the degree of interference or non-interference by vehicular traffic or of safety of pedestrians and persons boarding or alighting from the cars. There is a great difference in the conditions of operation and in the gross revenue concerned, and even though the management of all the lines is now under the control of the same organization the results are determined to a large extent by inherent factors which cannot be changed easily.

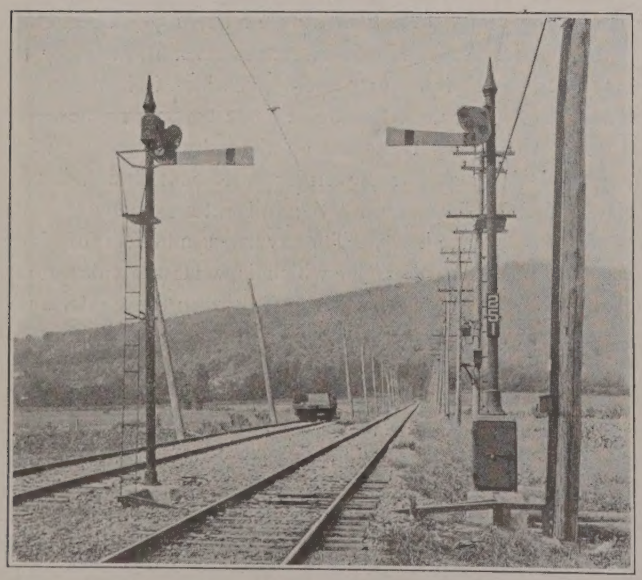
High-Speed Service Between Allentown and Philadelphia

Improvements in Track Signals and Cars to Give High-Speed Service in Northeastern Pennsylvania

The Lehigh Valley Transit Company, Allentown, Pa., is now completing arrangements for the inauguration of a high-speed service between Allentown and Philadelphia on or about Aug. 15. The new service will be given via the

Lehigh Valley Transit—Typical Passenger and Freight Station

lines of this company from Allentown through Quakertown to Lansdale, from Lansdale to Norristown, thence from Norristown over the tracks of the Philadelphia & Western Railroad to the terminal of that company at Sixty-ninth Street, West Philadelphia. The running time from Allentown to the City Hall, Philadelphia, will be two hours and thirty minutes, comparing with the old running time of four and one-half hours via the Chestnut Hill route.



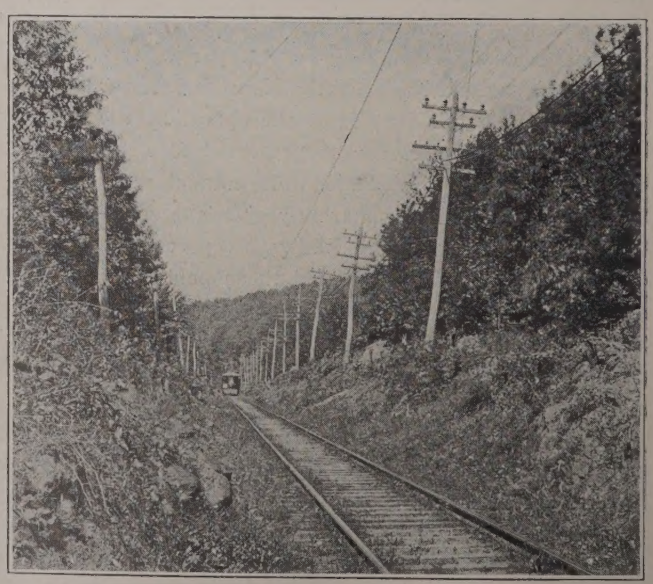
Lehigh Valley Transit—Block Signals on the High-Speed Section of the Line

In order to make this possible, the Lehigh Valley Transit Company had to relocate and reconstruct a considerable amount of its trackage and to equip 41 miles of single track from Emaus Junction to Norristown with continuous track circuit automatic block signals. Six steel cars with most luxurious fittings have already been provided for this service. The following paragraphs give a brief description of the block signals and a more extended account of the many interesting features of the cars, including the use of roller bearings.

SIGNAL SYSTEM

The General Railway Signal Company, Rochester, N. Y., has furnished the continuous track circuit automatic block signal system which consists of thirty signals and eighteen blocks. Twelve of the passing points will be stub-end sidings and six will be passing sidings. Semaphore signals will be employed to operate in two positions, namely, 0 deg. to 90 deg. in the upper left-hand quadrant. Model 2A direct-connected mechanisms equipped with 25-cycle single-phase induction motors will be employed for the operation of the semaphores. All of the relays and other apparatus required at each location are mounted in an apparatus case at the base of the signal mast.

The control of the signal will be absolute. The track relays will be the Model 2, Form A, and the line relays Model 2, Form B type. The control of the signals will be by means of a continuous track circuit, both rails being retained for the return of the propulsion current. Switch indicators will be employed as required at outlying points. In some cases indicators equipped with time element devices will be used at the sidings. The time element indicators are interconnected with the system in such a manner that when a switch has been thrown they will go to stop and will clear only after a predetermined time has elapsed, provided the block has not been entered by a train in the meantime. The time element indicator, therefore, serves practically the same purpose as a preliminary track circuit. The entire signal system was furnished and installed by the



Lehigh Valley Transit—A Tangent Section on Right-of-Way

signal company under the direction of its New York office.

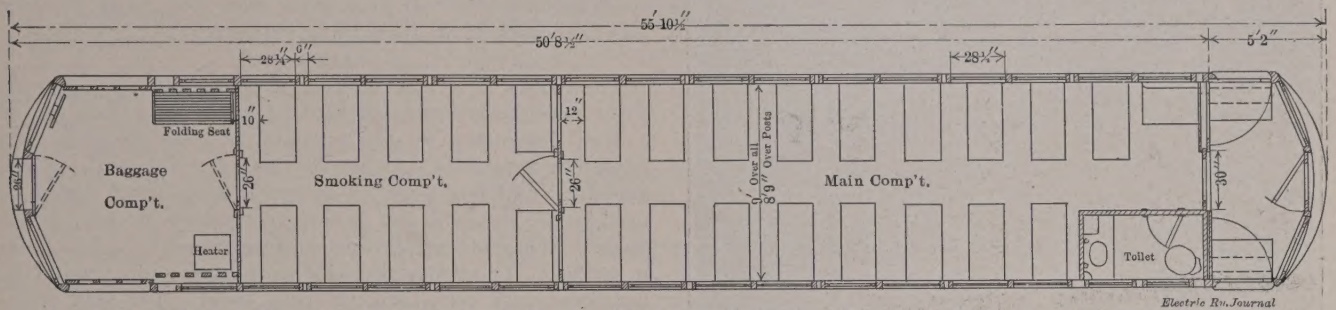
DIMENSIONS AND CONSTRUCTION OF CARS

The six steel cars previously mentioned are now being completed by the Jewett Car Company. These cars are notable as the first all-steel rolling stock used on a Pennsylvania interurban railway. The general dimensions of these cars are as follows:

Length of car body	50 ft.	8½ in.
Length of platform from end of car body to end of sheathing	4 ft.	8 in.
Length of car over vestibule	54 ft.	10½ in.
Length of car over bumpers	55 ft.	10½ in.
Width of car at sides including plates	8 ft.	9½ in.
Extreme width of car	9 ft.	0 in.
Height from rail to top floor		48½ in.
Height of rail to top of trolley boards	13 ft.	0 in.
Center to center of bolster	35 ft.	0 in.

The entire bottom frame of the car is made of structural steel and plates, the whole being designed to take all electrical apparatus, air and hand brake equipment and draft rigging with minimum alterations. The bolsters are of steel plates with pressed-steel fillers. The corner posts and drop sashes and the swing doors have double sashes, the bottom sash being arranged to remain stationary and the upper sash to drop. The step openings are inclosed with single hinged doors and the openings between the edge of the platforms and the vestibule doors are fitted with National steel trap doors made by the Transportation Utilities Company, New York. The triple steps placed on each side of the step entrance have lead treads. The height from the rail to the first step is 16¾ in., from the first step to the second step 11 in., and from the third step to the car floor 11 in.

The roof is of monolith pattern and extends over the



Lehigh Valley Transit—Plan of Steel Car for High-Speed Service Between Allentown and Philadelphia

all other posts are of steel angle irons, and the sheathing up to the window sill is of ⅛-in. steel plate, 36 in. wide. All finish is in wood. The inside of the car from floor line up is of solid inlaid mahogany. The wood for other purposes is Southern long-leaf yellow pine. Double flooring with building felt between the two floors is used. The under flooring is ⅞-in. yellow pine and the top flooring ⅞-in. narrow maple boards laid longitudinally. Linoleum is used in the passenger and smoking compartments. The aisles also have a ⅝-in. rubber mat in addition to the linoleum.

The platforms are inclosed with stationary round-end vestibules sheathed outside and inside below the windows with sheet steel. Each vestibule front has two windows and a mahogany swing door with 26-in. opening. Brass wearing strips protect the doors. The windows have single hoods. It is strengthened with concealed steel rafters ½ in. thick. The sixteen deck sashes are glazed with leaded art glass. The roofing for the main roof and hoods was furnished by the Transportation Utilities Company. The headlining is of agasote. Ventilation is provided by eight automatic ventilators furnished by the Automatic Ventilator Company, New York.

The windows throughout the car have ¼-in. plate glass, but the oval windows over the main sash and the side of the car and deck windows have cathedral glass laid in lead. The windows are arranged to rise to a height which will not obstruct the view of seated passengers.

The curtains are of the Duplex folding type, the outside curtain being of pantasote and the inside of plain green silk, both with Curtain Supply Company's ring fixture No.

Lehigh Valley Transit—One of the New Cars for the High-Speed Service to Philadelphia—These Cars Have Roller-Bearing Journals

188. A curtain is also installed on the front end of the car for the protection of the motorman. The car trimmings in the passenger and smoker compartment, including the basket racks, are of solid bronze. No advertising moldings have been installed.

The seating in the main compartment consists of high-back plush seats, and that in the smoking compartment of

Lehigh Valley Transit—Smoking Compartment End

high-back genuine leather. However, in two of the cars, which will be used for special limited service, the smoking compartment has no seats whatever, but is provided with the standard chairs of Pullman club cars, eight on each side.

COMPARTMENTS

The general division of each car into a passenger compartment, smoking compartment and baggage compartment is shown on the previous page. This plan indicates a seating capacity of sixty-four passengers, including the use of two folding seats on the platform but not the folding seat in the baggage compartment. The passenger compartment which occupies the space of ten windows is furnished with a toilet room in one corner. This toilet room is finished in white enamel and is unusually well equipped, including nickel-plated trim and fittings, standard Pullman wash-bowl, porcelain Dumpit hopper, appliances for liquid soap, sanitary towels, large beveled mirrors, etc. The water for the wash basin and flush toilet is taken from a 60-gal. tank installed over the toilet room. The floor of the toilet room is covered with linoleum. A nickel-plated alcove is installed on the outer side of the toilet room for the water cooler.

The smoking room occupies the space of five windows. It is separated from the main compartment by a mahogany partition with a single light of ¼-in. plate glass on each side of the door and a single swing door 26 in. wide which opens into the smoking compartment. The front of the car consists of the baggage compartment, which is approximately 8 ft. 4 in. long and is separated from the smoking compartment by a solid panel partition. This compartment is finished in ash, mahogany-stained, and has a 3-ft. 6-in. baggage door on each side. The floor is maple.

PAINTING OF CAR

In painting the cars three coats of white lead were used on the roof canvas, glue size being prohibited. The underside of the roof received one coat of boiled oil. The outside of the car body was painted as follows, allowing forty-eight hours between each coat: one coat of oil and lead priming, to be puttied with lead putty; three coats of lead, three coats of rough stuff, scoured to a surface, one coat of ground color, two coats of color and two coats of wearing body varnish. The under side of the car-body frame received two coats of lead paint mixed in oil; the top side of the flooring two coats of boiled oil, and the dasher three coats of lead, one coat of ground color, two coats of color and two coats of wearing body varnish.

TRUCKS

The trucks have a wheelbase of 78 in, and are designed for a maximum center-pin load of 31,000 lb. They are of a type designated by the builders as class 78-30-A, and represent a revision of the old class A truck with details simplified and improved. The equalized pedestal design is used, with separate end frames composed of 3-in. x 3-in. angles. The side frames are of forged iron, 1¼ in x 3 in. in section. The pedestals, which are of the same material, are fitted with renewable wearing shoes. Ten-inch channels are used for the transoms, and they are secured to the side frames by malleable-iron gussets which have large bearing surfaces and provide the stiffness necessary to hold the truck square.

The wheels are of forged steel, 36 in. in diameter with rims 4 11/16 in. x 2½ in. thick. They are mounted on steel axles having 5-in. x 9-in. journals, which run in boxes

Lehigh Valley Transit—Main Passenger Compartment and Washroom

furnished by the Standard Roller Bearing Company, as hereinafter noted. The double equalizing beams rest directly on the boxes, and they are formed with a single curve of long radius, which adds to their strength and simplifies the operation of forging. The truck frame is supported on the equalizers by four double-coil springs on each side. By increasing the number of springs in this

way and making them comparatively light, the riding qualities of the truck are improved. The cast-iron bolster is swing-supported on a double elliptic spring at each end. The brakes are inside-hung, the levers and shoe hangers being supported by the transom gussets. The brake beam is of the radial type and is arranged with a coil release spring on each side. The truck is designed to accommodate inside-hung motors and to pass over the sharpest curves on the line, which have a radius of 35 ft.

ROLLER BEARINGS

In June, 1910, one of the Lehigh Valley Transit Company's cars was equipped with a set of standard roller-bearing car journals made by the Standard Roller Bearing Company, Philadelphia. In March, 1911, a second equipment was installed. In January, 1912, this set was placed in service and in March, 1912, two more sets. As these bearings gave uniformly satisfactory service and showed no wear, the Lehigh Valley Transit Company ordered the same type for the six new cars.

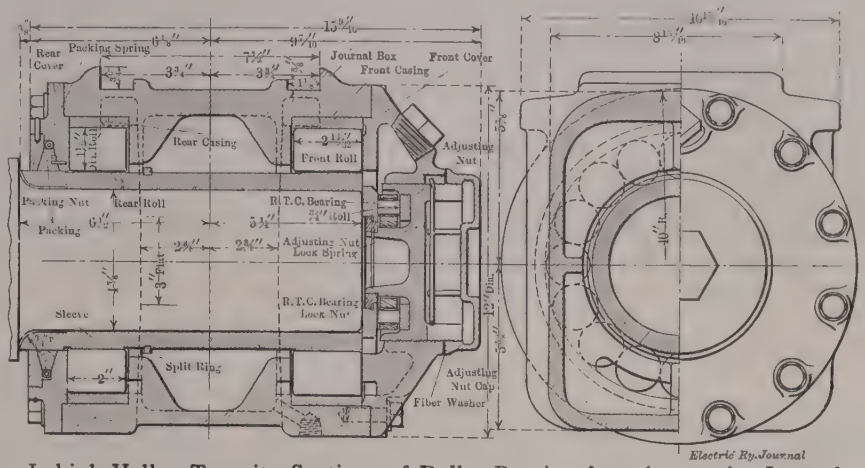
The present roller-bearing journals conform to the American Electric Railway Association standards. They consist essentially of a sleeve which slips over the journal, a casing which fits in the housing or box proper, rollers rolling between the sleeve and casing and a Standard plain roller thrust bearing, carried by a thrust nut readily adjustable in the front cover. The sleeve, casing and rolls are made from alloy steel and are heat-treated, tempered and accurately ground to uniform diameters. The roller thrust bearing consists of two washers or tread rings and of a cage in which the rollers are self-contained. The washers and rolls are also made of alloy steel, heat-treated, tempered and ground. The cage is of phosphor bronze.

To do away with all small loose pieces in the journal, the thrust bearing is made to form a part of the thrust nut. This construction means that the thrust bearing is removed with the thrust nut, thus making the inspection of

Lehigh Valley Transit—Smoking Compartment of New High-Speed Car

the journal and the replacement of the thrust bearing and nut a very simple operation. As there is no part of the thrust arrangement which is subject to change through wear, the desired amount of lateral movement between the axles and the journals always remains the same. Consequently, the best adjustment always obtains when it has once been secured.

The bearings, as furnished, are self-contained and are completely assembled in the factory ready for installation. The journals are turned to a diameter slightly smaller than the bore of the sleeve. To install the bearings it is only necessary to slip them over the journals and drop the truck



Lehigh Valley Transit—Sections of Roller Bearing for 5-in. x 9-in. Journal

frame into place. This feature is effected by making the sleeve of the bearing a slip fit on the journal and by the use of a self-centering ring which retains the sleeve in the journal box.

To prevent leakage of lubricant through the rear of the box, an automatic take-up gland is used. This consists of an ordinary V-shaped gland carrying a felt packing ¾-in. square. On top and around the packing is a small coil spring with the ends joined. The tension in the spring pulls the packing firmly against the axle and compensates for any wear in the packing. The sleeve is carried through the rear cover to prevent the spring from forcing the packing out of place when the box is removed from the axle, and the packing runs on the sleeve instead of on the dust collar seat. To prevent leakage from the adjusting nut in the front cover, the threads have been made long, and as a further guard a cap is also used. This cap serves a double purpose; in addition to forming a seal against leakage, it lends a neat and attractive appearance to the bearings and trucks.

EQUIPMENT

The electrical equipment for each car consists of four No. 303 100-hp Westinghouse motors and type AL control, as described in detail in the ELECTRIC RAILWAY JOURNAL for July 13, 1912, page 63. As noted in that article, the control is arranged to operate interchangeably with the type M equipments of the Philadelphia & Western Railroad. The air-brake equipment includes one D-2-EG Westinghouse air compressor. The hand brakes are all of the Peacock type. The lighting of the car is furnished in part by twenty 16-cp tungsten lamps. There is one light in each vestibule, one in the toilet, and the remainder are distributed uniformly along the sides, hanging vertically underneath the ventilator sash. The lamps inside the car are furnished with Holophane shades. These lamps are connected from two Edison type A-6 storage batteries to insure uninterrupted lighting. The other lighting of the car consists of four clusters of five 16-cp lamps each. Three clusters have been placed in the main passenger compartment and one in the smoking compartment. Each cluster is entirely concealed inside of an artistic dome which has a ground-glass globe at the bottom. The lighting equipment also includes one arc headlight.

The miscellaneous electrical equipment is controlled from a plate switchboard, carrying the switches, fuses and circuit-breakers, which is placed in a transite-lined cabinet in the baggage compartment. A 10-amp Hart snap switch is located in each vestibule for the headlight control. The

electrical circuits are run in conduit wherever wires are run under the car and between partitions. Each car is heated by six Consolidated electric heaters, placed on one side of the car, and by a Peter Smith hot-air heater located in one corner of the baggage room as shown on the plan. The hot-air duct, which is on the side opposite the electric heaters, is backed by ⅛-in. transite. It is intended to use the electric heaters in the spring and fall when the hot-air heater is not needed, and also to help out the large hot-air heaters on very cold days or when the fire in the coal heater gets low.

MISCELLANEOUS FEATURES

Among the miscellaneous mechanical features are Hedley anti-climbers, two Universal air sanders, 12-in. Dedenda pedal alarm gongs, locomotive type pilots and automatic car couplers. The center bearings are of the Symington type. The trucks are of the Baldwin type, with 5-in. x 9-in. journals, similar in design to the builders' trucks for locomotive tenders. The application of roller-bearing car journals to these cars has already been described.

TRACK RECONSTRUCTION IN ST. LOUIS, MO.

During the recent summer the United Railways Company, of St. Louis, Mo., has rebuilt several miles of track laid in paved streets. In order to reduce the cost of maintaining joints and at the same time increase the bonding efficiency, a composite joint of the Nichols zinc type was employed. The reconstruction work also included riveting the joints and the provision of special combination tie plates and rail clips which were applied to each tie by means of screw pikes.

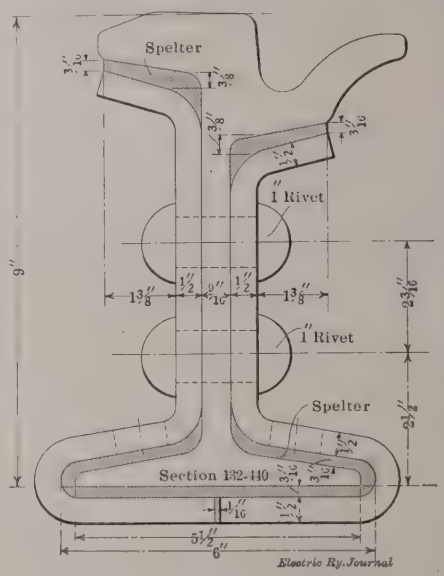
The composite joint is 32 in. long and consists of two ½-in. steel plates shaped as shown in the accompanying drawing of the rail section. These plates were field-riveted to the web of the rail, after which the space under the head and base of the rail, as well as the space surrounding the rail base, was filled with molten zinc to insure an absolutely continuous and perfect bearing between the rail and the joint plates.

Before these steel plates were installed the ends of

St. Louis Track—Sand-Blasting Outfit and Electric Drill

the rail and the inner surfaces of the joint plates were thoroughly cleaned by means of a sand blast. A special car carrying a motor-driven air compressor, air receiver and sand tank was provided for that purpose. After the rails were cleaned the ends were butted together so as to leave no open space at the joint. The joint plates were then applied and bolted temporarily with two 1-in. bolts, great care being taken to see that the rails were in perfect alignment. The holes in the plates and web of the rail were then reamed to insure even bearing along the entire length of rivet. The riveting was done by means of a Hanna pneumatic riveter suspended by a triplex trolley hoist running on a swinging I-beam jib crane. The crane was mounted on a work car, which also carried two forges for heating rivets, a motor-driven air compressor and an air receiver.

The second car, which carried the zinc-melting outfit, contained two crude-oil torches for heating the joints, two oil furnaces for melting the zinc, air compressors and air receivers. After the riveting had been completed the joints were heated to prevent the freezing of the molten zinc when it was poured into the joints. The ends of the joint plates were plugged with fireclay, and special clamps were placed over the opening under the head and base of the rail to prevent leaking and to direct the metal into the joint. The zinc was poured into the joint through small openings provided for the purpose. For 9-in. rails six 1-in. rivets were used and for 7-in. girder or 6-in. T-rail ten 1-in. rivets.



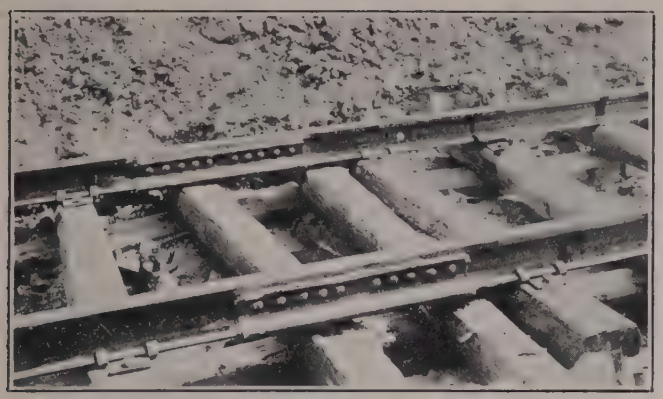
St. Louis Track—Section Through Zinc Rail Joint

The rail sections which were employed with these joint plates were the 9-in. Lorain section 440, weighing 132 lb. per yard; 7-in. Lorain section 426, weighing 103 lb. per yard, and the 100-lb. A. R. A. T-rail, 6 in. high. The labor cost of installing plates on 9-in. rail was about $1 per joint, and for 7-in. rails about 80 cents per joint.

In addition to these joints the Railways company used screw spikes with flat tie plates laid on 6-in. x 8-in. x 8-ft. oak ties spaced at 2-ft. intervals. To insure a true bearing area under the tie plates, all ties were dapped at the material yard before being delivered to the work. The same machine employed in dapping the ties also drilled the holes for the screw spikes. The tie plate used on a large part of the work is a 7-in. x 10-in. x ⅜-in. flat steel plate, at each corner of which a strip of metal 1 in. wide and 2½ in. long was sheared and bent at right angles to the plate. To attach the rail to the plate these strips of metal were bent down flat over the base of the rail, as shown in the illustrations, by means of a spike maul or sledge. The holes for screw spikes were punched 1¼ in. from the base of the rail so that the spike bore directly on the tie plate and did not touch the rail.

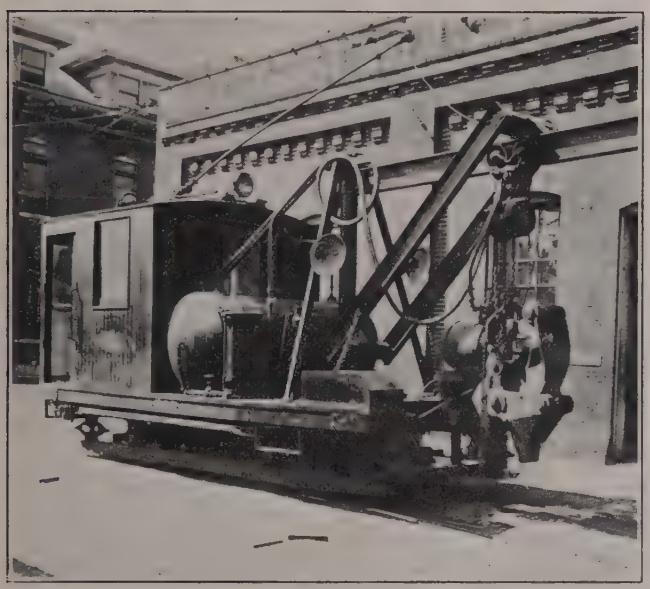
All of the screw spikes were driven by means of special portable screw spike-driving machines, built by the Chicago Pneumatic Tool Company. The screw spikes used were of special size, ⅞ in. x 6 in., with a head 1¾ in. square and 11/16 in. thick. One of the electric machines would drive about 100 spikes per hour and required three men for its operation.

The special cars used on all of this work were built and equipped in the shops of the United Railways Company, working under the direction of Richard McCulloch, vice-president and assistant general manager.

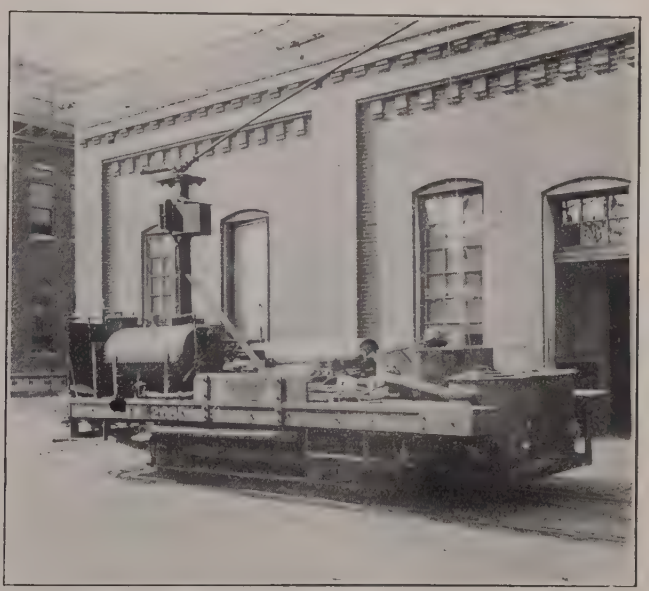


St. Louis Track—Completed Zinc Joint Upon a 100-lb. T-Rail

St. Louis Track—Method of Clamping and Pouring Zinc Joint



St. Louis Track—Work Car with Pneumatic Riveter Suspended from Jib Crane, etc.



St. Louis Track—Zinc-Melting Furnaces, Oil Tanks, Air Tanks, Compressor, etc.

St. Louis Track—Portable Screw-Spike Driving Machine in Service

St. Louis Track—Riveting T-Rail Joints with Portable Rivets

The Northwest Power Station Railway of the Commonwealth Edison Company

A Novel Electric Railway Built and Equipped for the Sole Purpose of Transporting from a Nearby Steam Railroad the Necessary Coal, Supplies and Machinery for a Large Power Station in Chicago

An unusual electric railway has recently been completed by the Commonwealth Edison Company. It was constructed and equipped in order to connect the Northwest power station, which is located on the banks of the Chicago River, with the tracks of the Chicago & Northwestern Railroad, about 1 mile distant. The construction of the new Northwest station, which is the latest and most extensive of the power plants of the Edison company, was described in detail in the Convention Section of the Electric Railway Journal for Oct. 5.

The Commonwealth Edison Company is noted for the foresight displayed in the planning of its stations, and the electric railway is undoubtedly part of a general scheme much larger than the present construction indicates. Otherwise the elaborate track construction and electric locomotive equipment would seem out of proportion to the work which it is now called upon to accomplish, which consists primarily in handling coal, ashes and construction materials. The layout of the plant and electric railway trackage is shown in the plan on the opposite page. It comprises three main divisions—the present and contemplated track in the power plant grounds; the double-track line on a private right-of-way, and the company's projected yard contiguous to the Chicago & Northwestern Railroad tracks. At present there are approximately 5 miles of single track installed, which includes the main line, connecting with the railroad company's yard, and a portion of the contemplated trackage in and about the power plant.

The track construction is of the same general character as that of the Northwestern Railroad with which the system connects. In appearance it is like the New York Central & Hudson River Railroad's electrified track, having the same general arrangement of protected third-rail. The track is A. S. C. E. standard T-rail, weighing 80 lb. per yard, and the ties are of white oak, 6 in. x 8 in. x 8 ft. in dimensions, spaced 22 in. between centers. The track is heavily ballasted with trap rock crushed to pass through 1½-in. mesh screen, giving as substantial a foundation as it is possible to obtain. The rails are raised to such a height above the level of the surrounding ground that excellent drainage is secured.

Every sixth tie is of 1½ ft. extra length and carries the third-rail insulator bracket. The inverted third-rail is a 70-lb. bullhead rail of special composition, similar to that used by the New York Central Railroad. It is insulated from the brackets by porcelain insulators and is covered with yellow-pine planking treated with carbolineum. The use of carbolineum for this purpose instead of creosote resulted in the saving of several thousand dollars, and, as far as can be determined from present indications, it will give entirely satisfactory results.

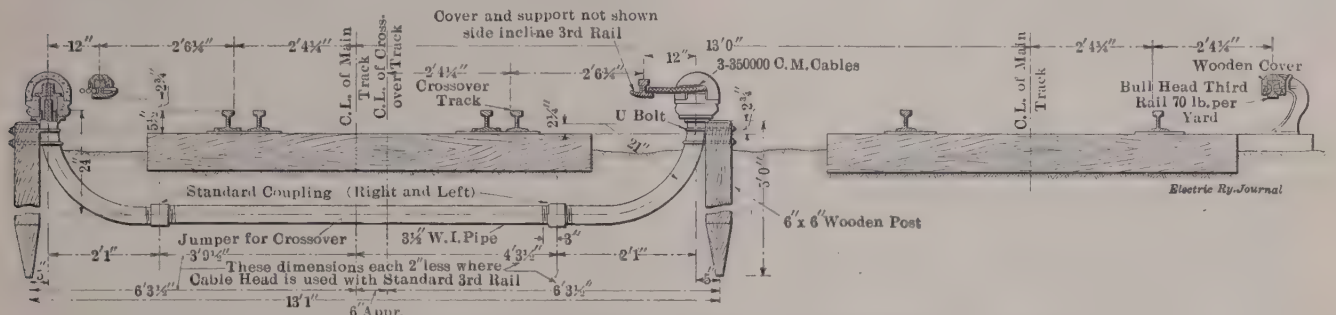
Power Station Railroad—General View Showing Bridges and Embankment of Main Line

Power is transmitted to the third-rail by means of lead-covered, paper-insulated cables of 1,000,000-circ. mil total area located in iron conduit beneath the track. There are four of these large feeders from the substation to four sections of the contact rail. The two contact rails along the main line to the Chicago & Northwestern tracks are fed through two separate feeders. Another feeder supplies the third-rail in the boiler room and the fourth connects with the third-rail located in the coal-storage yard. The cables are brought out through iron conduit terminating in porcelain cable heads, supported by wooden posts, as shown in the accompanying line cut. This also shows details of a cross-over with the arrangement of jumper connecting the contact rails on the two sides of the track. The center line of the third-rail is 2 ft. 4¼ in. from the gage line of the track, and its under surface is 2¾ in. above the track surface.

Referring to the general plan it will be noted that at the railroad end of the line a storage trackage of about ¾ mile is provided. This will permit the storage of several thousand tons of coal or construction material in cars. This

yard is electrically equipped, but steam locomotives are used by the steam road to bring cars to the boundary of the Edison company's property. Between the storage yard and the power plant grounds the line is double-tracked, and it crosses several streets, including four wide ones. Over these streets plate girder bridges, of strength sufficient for the heaviest steam traffic, were constructed.

In the station yard the tracks have been laid out as symmetrically as possible with a view to accomplishing

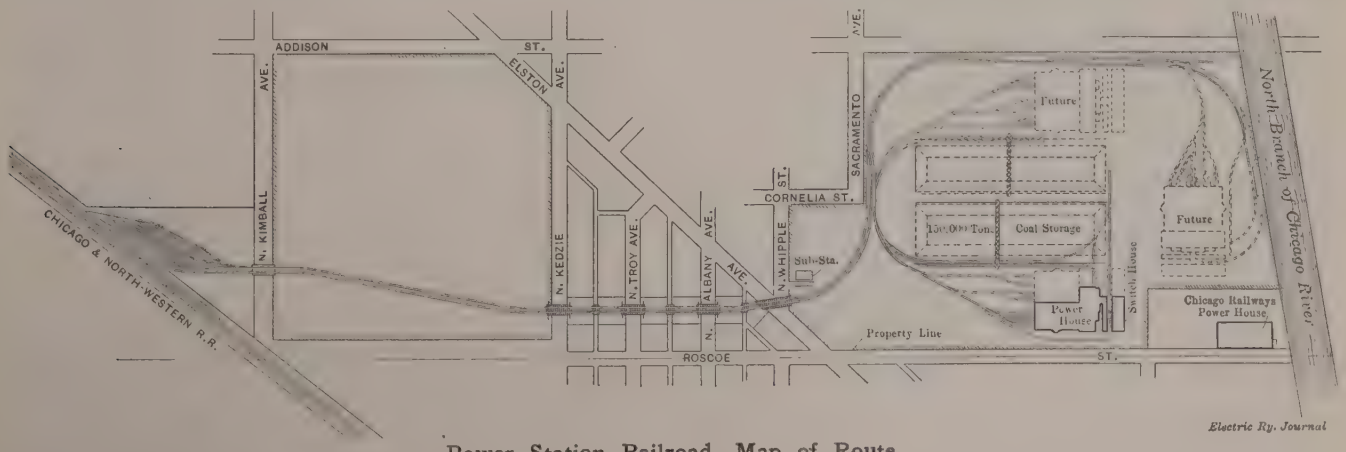


Power Station Railroad—Details of Third-Rail Construction at Cross-Over

several purposes. The track enters the southwest corner of the property and follows the west, north and east boundary to a point on the bank of the North Branch of the Chicago River convenient for the unloading of material from barges if that should be found desirable. From a point on the west boundary a branch leads along the south side of the power house for the purpose of carrying construction and repair material. From this line branches lead also to the ground floor of the boiler house, four tracks to each third of the building. The inside two of these are for coal supply, the outside two for the removal of ashes. A double-track branch from the main line also leads along the north and south side of the coal storage of 300,000 tons capacity and permits the ready removal of coal from the cars to the storage piles by means of gantry cranes. These are not, however, installed at the present date. One of the tracks of the south coal storage branch is extended to connect with the turbine room and the transformer house tracks. The former extends completely through the turbine room and upon it the cars can bring material directly under the 100-ton crane, the range of which covers the entire turbine room. The latter track is located alongside the transformer

built up of steel castings rigidly bolted together. These frames are supported upon equalized semi-elliptical journal-box springs. The trucks are connected by a heavy hinge, and the drawbars are carried on the outer truck-end frames, the makers claiming that by this construction the draft and buffing strains from drawbars and buffers are transmitted directly through the truck frames, instead of through the center pins, which carry in consequence only the strains due to the weights of platform and cab. The platform is laid upon a frame made up of channels riveted firmly together, the flooring being of heavy steel plates extending the full width of the platform and riveted to the sills. The cab is in three parts, as usual in this type of locomotive. The center section contains the engineer's seats, brake valves, air compressors, switches, etc., while in the auxiliary cabs are the contactors, rheostats and air reservoirs.

There are four GE-207 motors geared to the axles with a ratio of 3.76 and producing a maximum starting effort of 30,000 lb., which easily starts ten loaded cars. This assumes that the wheels will not slip below 25 per cent adhesion. The corresponding current is 425 amp. At the rated load of the motors the tractive effort is 15,000 lb., corresponding



Power Station Railroad—Map of Route

house. The transformers, or compensators, are on wheel-bases located on short tracks perpendicular to the line of the building and therefore the railroad track outside. Thus the transformers can be readily rolled outdoors and loaded upon flat cars. In fact, every provision has been made for the greatest possible ease of handling fuel and machinery parts.

The motive power for the freight train consists of 60-ton electric locomotives designed for slow-speed switching

to a speed of 8.2 m.p.h. and an input of 460 amp at 600 volts. At 5000 lb. the speed is 11 m.p.h. The maximum speed of the equipment on level, tangent track is about 16 m.p.h. with a train of 230 tons gross weight and assuming 8 lb. per ton train resistance. The maximum allowable coasting speed is 40 m.p.h.

The control equipment is of the "M" type single unit, with seven series and five series-parallel steps and known as a two-speed control. It is not arranged for parallel opera-

tion of the locomotives. There are four third-rail shoes located 32 in. outside the gage line and 2¾ in. above the running rail, as previously explained. The locomotives are also provided with pantograph collectors having a range from 18 ft. to 22 ft. in height. These collectors are controlled by means of air from the brake system.

The air-brake equipment comprises two compressors of the GE-LT type and two main reservoirs 35 in. by 46 in. in dimensions. There are four 8-in. cylinders. The compressors have a displacement capacity of 50 cu. ft. per

Power Station Railroad—View of Tracks Showing Third Rail

minute at 90 lb. per square foot delivery pressure. The piping is arranged for use either as a straight-air or an automatic system.

In addition to the above essential features the usual auxiliaries are found on the locomotives, including luminous-arc headlights. The locomotives have been in operation for some months and the officials of the Edison company are greatly pleased with the results obtained from them as well as from the remainder of the equipment. At present power is taken from a neighboring power house of the Chicago Railways Company, shown on the general plan. There is no 500-volt equipment in the Northwest station, and the Edison company is willing to "take its own medicine" by buying energy in this form from a company which has

Power Station Railroad—Electric Locomotive Used on the Line

500-volt d.c. power available. A duplication of investment in this community is thus avoided.

The form of oil burner which consists of a piece of piping mashed down at the end and coupled to a steam or air line and an oil supply is one of the most wasteful means of burning liquid fuel, as it does not thoroughly atomize the oil and in consequence permits much of it to be passed through the furnace in such large globules as to afford an insufficient time for complete combustion.

USE OF ALLOYS IN STEEL AND IRON

The use of alloys in the manufacture of the better grades of steel and iron is becoming more and more popular because of the improved metal obtained after treatment. The subject is receiving considerable study, especially in its application to rails and castings which require great ductility and abrasive resistivity. Experience with iron and steel thus treated has demonstrated its increased wearing qualities, and it may be of interest to describe briefly the chemical action by which these beneficial results are obtained.

The alloys used for this purpose are found in limited deposits in various parts of the world and are usually combined with iron. This combination not only provides an alloy with a low fusing point but reduces the cost to the consumer to a point where it is not prohibitive for practical purposes. The alloys most commonly used include ferro-titanium, ferro-manganese, ferro-vanadium and nickel-chrome. Each has chemical qualities peculiar to itself, yet in the broad sense each will act as a scavenger or purifier if added to molten steel or iron in sufficient quantities. The ferro-manganese and titanium are used largely as scavengers, being the cheapest of all the alloys because they are most abundant. In the scavenger or purifier action the object is the removal of undesirable impurities. The principal impurity in molten steel is oxygen in the form of iron oxide, which is dissolved in the molten steel. To remove this the addition of any element is effective which has a greater affinity for oxygen than the iron. The addition of silicon to iron oxide results in purer iron and the silicon oxide passes off into the slag. When ferro-manganese or ferro-titanium is added to the molten iron the alloys combine with the impurities and pass off with the slag. Ferro-titanium is a very active alloy, having a greater affinity for oxygen than any of the others, and is, therefore, used in large quantities for purifying steel and iron. Ferro-manganese is also used, but is more expensive and does not have as great an affinity for oxygen as ferro-titanium.

Vanadium is not employed as a scavenger, because it is too expensive when compared with the other two alloys, but it is employed in what are commonly called special alloy steels. In this case the added element remains in the steel as an essential constituent. It does not change into its oxide, as in the former case, but is mixed or dissolved with the steel, though not chemically combined with it. Both manganese and vanadium when alloyed with steel in small quantities produce very desirable results. After heat treatment the metal becomes very hard and at the same time ductile. The manganese is largely employed in the manufacture of rail, special work, gears, pinions, dipper teeth for steam shovels, rock and ore-crushing machinery and, in fact, wherever improved wearing qualities and toughness are desired. The vanadium alloy steels are employed in the manufacture of tools, axles, and in general where the resistance to vibration and often-repeated stresses is important. To obtain the maximum results from vanadium, heat treatment is necessary; this increases the ductility, but does not materially affect the hardness. The high cost of products manufactured from these special alloy steels is not due to the expensive composition particularly, but is due largely to the cost of production of a given article. The molding and core-making require more care and a higher degree of skill in their preparation, because the castings are extremely hard and tough, making them expensive to finish. All finishing is done by grinding, as no machine tool is hard enough to withstand the severe strain.

Both vanadium and titanium are being added to cast iron, and the resulting metal is more homogeneous, more fluid, more uniform, closer grained, cools more slowly and settles more quietly in the mold.

Traffic Count in Philadelphia

The City Has Been Divided Into Districts and a Systematic Record Is Being Made of the Points Where Passengers Board the Cars and Their Destination—This Is Part of an Elaborate Study Into the Transportation Conditions in Philadelphia Being Conducted by the Transit Commission

Announcement was made in this paper some months ago of the appointment by Mayor Blankenburg to the office of transit commissioner in Philadelphia of A. Merritt Taylor, who had had a long practical operating experience in electric railways as president of the New Jersey & Hudson River Railway & Ferry Company, the Philadelphia & Westchester Traction Company and the Riverside Traction Company, and has reorganized many other railway enterprises. The appointment was made under authority of ordinances passed by the City Councils in Philadelphia "to investigate the problems of improved transit facilities for Philadelphia, with a view of determining advisable means for obtaining rapid, efficient and cheap transit through the city and its suburbs by the use of subways or other approved modern methods; to consider fully the question of public and private ownership and the financial and economic aspects of the problem; to prepare a report covering the investigations, and to recommend ways and means whereby convenient and rapid transit, commensurate with the present and future needs of the entire city and its suburbs within a reasonable number of years, may be secured."

Mr. Taylor accepted the office of transit commissioner upon condition that he might serve the city without compensation and early determined that to reach a proper solution of the transit problem in Philadelphia it was necessary to determine first the present movement of traffic. This work, which is now being done, is planned to include not only the traffic on the lines of the Philadelphia Rapid Transit Company, but also the suburban traffic by the steam railroads and ferry lines in Metropolitan Philadelphia, which for the purposes of this study is considered to be all territory within the radius of 16 miles from the Philadelphia City Hall.

In his letter outlining the plan to be followed by him Mr. Taylor said in part:

"Acts should be drafted to enable the city or corporations formed for that purpose upon securing municipal consent to construct additional transit facilities on, under, over, through and across streets and private property in the city and grant the right to the city to lease such facilities or parts thereof. The proper machinery should be provided to ascertain what additional facilities are needed from time to time hereafter, where they should be located and how they should be designed, built and operated, and to ascertain the probable cost thereof and the probable result of operation thereof, for the guidance of the City Council.

"If such facilities are authorized, the proper machinery should be described for making the necessary plans, taking the bids, the awarding of contracts, the supervision for carrying out such plans and for the negotiations and consummation of leases of such facilities. Machinery should also be provided for the operation of such facilities by the city in the event of failure to secure private operation.

"If such facilities are constructed and owned by the city in whole or in part they should be deemed a local improvement, and the proper machinery should be prescribed, which should have the power to determine whether all or any, and if any, what, portion of their cost and expense shall be assessed upon the property benefited thereby, and provision should be made that such assessment should be laid, confirmed and collected."

To assist in this program Mr. Taylor has engaged Ford, Bacon & Davis, New York, as consulting engineers. As mentioned last week, John G. Johnson, a prominent Philadelphia lawyer, has accepted the duty of drafting the necessary legislation to secure the proper legal status of the city for carrying out the important rapid transit improvements which may be found desirable.

TRAFFIC STUDY ON SURFACE LINES

In the meantime an elaborate traffic study and count is being made on the surface lines of the Philadelphia Rapid Transit Company. It was begun Oct. 14 and will continue for about six weeks. The city is divided into 123 sections. Each section in general is a square mile in area. As a rule, each line is counted for one day, and from two to six lines are included in each day's program. In the event of unusually bad weather on any day, the count on that day is omitted and the entire program set back one day. The program provides for counting about one car in every five base schedule cars. No night runs are counted. The public is notified a day in advance of the plan to count the traffic on each particular line by signs which are posted in the cars. These signs state that on the following day a traffic count will be made on that particular line, and the public is requested to assist in the count by giving the necessary information to the inspectors.

Fig. 1—Traffic Count—Slip Used for Passenger Count Record

MEN EMPLOYED

Two men are employed on each car. These men are entirely distinct from the regular car crew. On a basis of thirteen cars per day with two shifts of two men each, a maximum of fifty-two men is required to conduct the count on any day. The shifts which have been made correspond as far as possible to regular runs. The men engaged on the work are conductors selected from the staff of the Philadelphia Rapid Transit Company, which gives their services to the city for this purpose. Out of the number selected about thirty men serve throughout the entire count on all lines. This allows one man per car per shift. The second man on each car is appointed for the day only and works under the direction of the first man. This second man is taken from the men who work on the particular line whose traffic is being counted, so that he is thoroughly familiar with all cross streets and other information which is required while the count on that line is being made. Both men wear their regular uniforms but do not wear the Philadelphia Rapid Transit cap badge. Instead they wear a special cap badge and breast badge indicating their connection with the transit commissioner's office. These badges bear the words "Traffic Inspector," and are pinned to ribbons which bear the words "City of Philadelphia" and are of the city colors, gold and light blue.

INSTRUCTIONS TO MEN AND BLANKS USED

Before beginning the count the thirty men who were selected to serve throughout the entire count were in-

structed as to their duties by the transit commissioner and were taught the use of the different blanks required for the count, as explained later. They also received printed instructions.

They are also supplied with blanks, padded like transfers, on which the information required is to be filled out, as shown in Fig. 1, and also a code list of cross streets applicable to that particular line, as in Figs. 3 and 5. Copies of this code, printed in large type, are also hung in the car and on the platform where they can easily be seen by the inspectors. This code list assigns a special number to each cross street to facilitate the work of entering the record of the street at which the passenger boards the car. One side of the card reproduced bears the code numbers if the car is northbound and the opposite side a set of code numbers if the car is southbound.

The slips shown in Fig. 1 are supplied to the traffic inspectors in pads of 100. These slips are printed in four colors to be used according to the direction in which the car is going. On the north and south lines gold color is used on northbound trips and green on southbound trips. On the east and west lines straw color is used on the eastbound trips and orange on the westbound trips. Each ticket also has a serial number and a stub bearing the same serial. The issue of these slips is made by the inspector selected for the day only, that is, by the man who is familiar with the route over which the car is running. He stands behind the conductor and as each passenger boards the car he marks in the upper right-hand corner the number of the street at which the passenger boards the car. In the example shown, No. 17 in the upper right-hand corner indicates that the passenger boarded the car at Ellsworth Street. At the same time he indicates on the ticket by a check mark the "class of fare collected." This is shown on the slip by the letters "C" for cash, "E" for exchange (a special type of transfer used in Philadelphia for which 3 cents extra fare is charged), "T" for a regular transfer and "D" for deadhead. He also indicates by a check mark whether the conductor issues to the passenger an exchange ticket or a transfer. In the blank shown in Fig. 1 the passenger has paid a cash fare and has received a transfer. These marks are made with lead pencil.

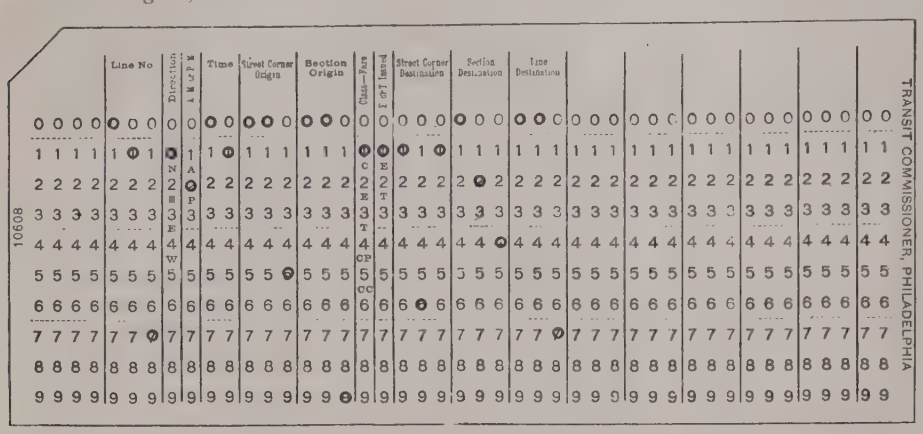


Fig. 2—Traffic Count—Card Punched to Agree with Slip Shown in Fig. 1

PHILADELPHIA RAPID TRANSIT CO.
LIST OF STOPS MADE ON THE
SOUTH 19TH & 20TH STS. LINE
SOUTH-BOUND

51	Front & Walnut	76	South
52	2d	77	Bainbridge
53	Dock	78	Fitzwater
54	3d	79	Catharine
55	4th	80	Christian
56	5th	81	Carpenter
57	6th	82	Washington Ave.,
58	7th	83	Ellsworth
59	8th	84	Federal
60	9th	85	Wharton
61	10th	86	Reed
62	11th	87	Dickinson
63	12th	88	Tasker
64	13th	89	Morris
65	Broad	90	Moore
66	15th	91	Mifflin
67	16th	92	McKean
68	17th	93	Snyder Ave.
69	18th	94	Jackson
70	19th (North)	95	Passyunk
71	19th (South)	96	Wolf
72	Locust	97	Ritner
73	Spruce	98	Porter
74	Pine	99	Shunk
75	Lombard		

Fig. 3—Code List of Streets

The inspector then hands the slip to the passenger with the request that the passenger shall retain it until it is collected by the collector.

At the beginning of each half trip the distributor fills in on the stub of the first ticket issued on that half trip the name of the line and whether the car is running northbound or southbound and the leaving time.

The collector is the second inspector on the car and one of the employees who serves throughout the entire traffic count. He passes through the car as soon as he sees the passengers become settled and collects the slips. As he does so he asks each passenger his destination and notes it on the space provided on the slip. In Fig. 1 the destination is Seventeenth and Tioga Streets. If the passenger is planning to exchange or to transfer to another car, the inspector asks the line on which he is going to change and his final destination and puts this information under the word "destination."

The collector keeps the slips collected on each half trip and at the end of the half trip places them in an envelope, marking on the outside the leaving time, direction and other data as shown in Fig. 6. These slips are left at the depots on every round trip when that is convenient, and from these points they are collected by the employees of the transit commissioner's office. On cars when prepayment of fare is not required one or two extra men are used, if necessary, to aid the inspectors and avoid delay.

All stubs and unused slips are turned in by the inspectors when the work is finished for the day.

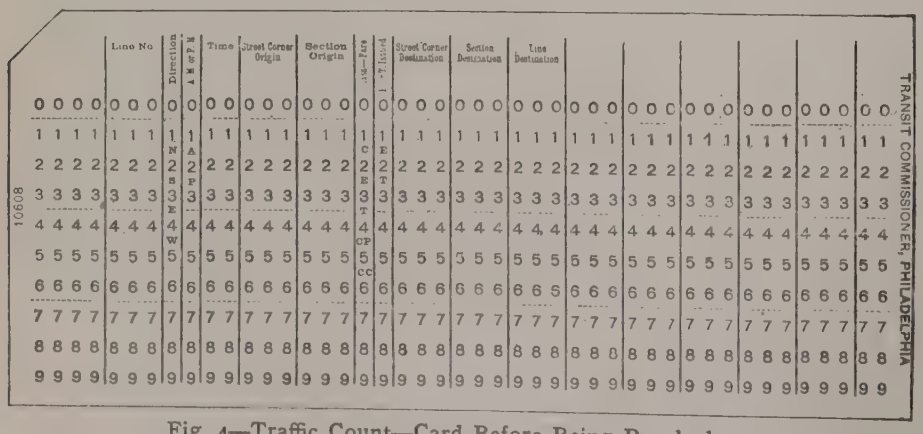


Fig. 4—Traffic Count—Card Before Being Punched

PHILADELPHIA RAPID TRANSIT CO.
LIST OF STOPS MADE ON THE
SOUTH 19TH & 20TH STS. LINE
NORTH-BOUND

1	Shunk	26	Pine
2	Porter	27	Spruce
3	Ritner	28	Locust
4	Wolf	29	Walnut
5	Passyunk Ave.	30	Sansom
6	Jackson	31	Chestnut
7	Snyder Ave.	32	19th
8	McKean	33	18th
9	Mifflin	34	17th
10	Moore	35	16th
11	Morris	36	15th
12	Tasker	37	Broad
13	Dickinson	38	13th
14	Reed	39	12th
15	Wharton	40	11th
16	Federal	41	10th
17	Ellsworth	42	9th
18	Washington Ave.	43	8th
19	Carpenter	44	7th
20	Christian	45	6th
21	Catharine	46	5th
22	Fitzwater	47	4th
23	Bainbridge	48	3d
24	South	49	2d
25	Lombard	50	Front

Fig. 5—Code List of Streets

The regular motormen and conductors have been instructed to give whatever assistance they can to the distributors. Passengers for whom fare is not paid, such as infants, policemen, firemen and company employees traveling on passes, are not recorded. Special instructions have been issued to avoid any cause of irritation to passengers.

OFFICE TABULATIONS

When the count slips reach the transit commissioner's office with the stubs, the remaining four numbers at the right-hand edge of the slip are filled in, care being taken not to disturb the order in which the slips are received. These numbers indicate respectively the code number of the section in which the passenger got on the car, in this case "11"; the stop number corresponding to the destination, in this case "133"; the section number of the destination, that is, the number of the particular section of the 133 into which the city was divided, in this case "30"; and the line number in case the passenger transfers to a different line, in this case "21." The slips are then checked up from the transfers and exchange tickets issued for the day by the company, which turns over its transfers and exchange tickets for this purpose to the commission. The slips are then sent to the Statistical Service Company. This company employs electrical sorting and tabulating machines similar to those used by the United States Census Bureau.

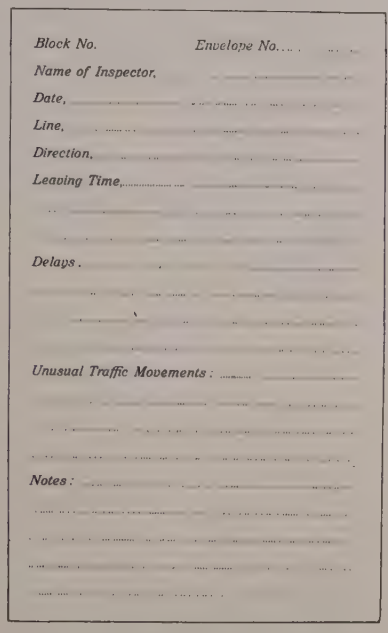


Fig. 6—Traffic Count—Envelope to Hold Inspector's Slips

TABULATIONS OF RETURNS

The tabulation of returns, which is done by the Statistical Service Company, is conducted one line at a time and, with the slips for each half trip, sorted as to direction, in a packet as delivered by the collector. The information on each slip is first transferred to a card, shown in Figs. 2 and 4. This card is 7⅜ in. long x 3¼ in. high. The numbers corresponding to the information given on the slip are stamped out of this card. Thus, the card shown in Fig. 4 corresponds to the slip shown in Fig. 1. Under "Line No." holes are punched as indicated in 017 to indicate line No. 17 or the South Nineteenth and Twentieth Streets line. In the column "Direction," 1 is punched to indicate northbound and under "a.m." or "p.m." 2 is punched to indicate p.m. Under "Time" 01 is punched to show the nearest hour to 1.05 p.m. Under "Street Corner Origin" 005 is punched to show Street Corner 5 or Passayunk Avenue. Under "Section Origin" 009 is punched to show Section 9 of the city, which includes on the South Nineteenth and Twentieth Street line the streets from Shunk to Morris inclusive. Under "Class of Fare" 1 indicates cash fare, and under "E or T Issued" 1 indicates exchange. In similar manner the punchings are made for street-corner destination, section destination and line destination. The last set of columns on the card and the first set on the card are not being used at present.

TABULATION

The cards are first sorted by machine according to the class of fare or ticket presented by the passenger. Then the packet of cards for passengers originating in each traffic section is sorted for their traffic section destination. The cards are then sorted for traffic section origin, next for traffic section destination, and then they are counted and the amounts thus obtained are entered on a tabulation having the traffic section origins in columns and the traffic section destinations on horizontal lines. The columns for each section are divided in parts for cash fares, exchange transfers and deadhead passengers. This tabulation is then cross-added and proved. After this is done the slips, cards and tabulations are sent to the transit commissioner's office.

In the transit commissioner's office the ratio of passengers counted to total passengers carried on each line on the day on which the line is counted are determined. The figures obtained from the Statistical Service Company are then multiplied by this ratio, and the amounts are entered on a diagram.

The transfers and exchange tickets turned over by the Philadelphia Rapid Transit Company to the transit commissioner are used to amplify the statistics obtained by the traffic count. Necessarily, as only a certain number of cars are counted, the statistics obtained as regards the transfer traffic would not be as complete as if all of the passengers were counted: To obviate this situation the regular transfers and exchanges collected on all cars of the line counted are analyzed. By an arrangement with the Philadelphia Rapid Transit Company all conductors are required during the period of the count to punch all transfers and exchange tickets when going in one direction. In a similar way all receiving conductors also put an extra distinguishing punch mark in the ticket to indicate their direction. These punch marks are in the upper two corners of the ticket; that by the issuing conductor in the upper right-hand corner and that by the receiving conductor in the upper left-hand corner. These punch marks or their absence give four combinations, so that they show whether the passenger is going north, south, east or west.

An idea of the extent of the work of tabulating these transfers and checking their points of direction will be conveyed by a statement that the total number of transfers and exchanges collected on the Philadelphia Rapid Transit System is about 300,000 in a day.

Before this count was taken the purposes and in general the methods of procedure were very well advertised in the Philadelphia daily papers. Every newspaper entered heartily into the plan and commended it, and articles were published in all of them for several days before the count was begun. In this way the public was fully apprised of the intention and was willing to co-operate to secure the results. As a result of this publicity very few people refused to give the information. In the lines checked up so far it has been found that the collectors have missed less than 1 per cent of the passengers.

OTHER WORK BEING CONDUCTED

Besides this tabulation of traffic, the transit investigation of the city of Philadelphia thus far undertaken includes the compilation of spot diagrams which indicate the resident population, one spot being used for each 100 inhabitants, and time-contour maps, based on the running times of the present transportation lines. These time-contour maps are being compiled with different strategic points in the city as bases. Thus the basis for one map is Market Street from the City Hall to Eighth Street. Local time-contour maps are also being compiled for other sections, such as Frankford, Germantown, South Philadelphia, etc. Another analysis being conducted is one of the assessed values of all parts of Philadelphia for different years.

Charts have also been prepared to show how many people were tributary to the existing Market Street subway-elevated line prior to its being placed in operation—that is to say, how many people lived in the district which has been made more accessible from the center of the city by the Market Street elevated line than it was formerly by the surface lines—and how many of these people in each time

zone were diverted from the surface lines to the elevated line when it was opened.

By analyzing the traffic statistics of the surface lines affected by the Market Street elevated line before and after the opening of that line, the earnings of the elevated line and the number of transfers issued at all points between the surface lines and the elevated lines, the commissioner expects to learn just how much business was diverted from the surface lines to the elevated lines and how much business was created by the elevated lines.

This information with the ascertained location of population and travel per capita originating in each section of Metropolitan Philadelphia developed by the traffic count and otherwise, and with the chart showing where all of the people travel to and from and by what route, together with accurate figures which are being made relative to cost of operation, will develop, it is expected, a very accurate estimate of the results of any new avenues of rapid transit recommended, whether operated as a part of the Philadelphia Rapid Transit system or independently. The amount of least profitable long-haul business which will be diverted from the surface lines in the various districts, the amount of new business which will be created, and what increase in business the cross-town surface lines will gain by reason of their becoming short-haul feeders to the new rapid transit facilities, will also be shown.

The same information will be developed relative to the relationship of traffic on the new rapid transit lines to traffic on the steam lines serving the same districts. There will doubtless be considerable saving in operating expenses on the surface lines because the street congestion will thereby be relieved, and this will enable the operation of a more efficient and economical street service in the congested district. In this way the commissioner believes that the city will be fully prepared to enter into negotiation with the Philadelphia Rapid Transit Company or any independent company with exact knowledge as to the gross and net earning capacity of each rapid transit line and any feeding lines recommended, whether operated independently or as a part of the present system, and as to what effect the operation of each line will have upon the gross and net earnings of the present system, whether operated separately or as part of it.

LOCAL ASSESSMENT FOR TRANSIT IMPROVEMENT

A very careful study is also being made of the effect of rapid transit facilities upon real estate values and development, and hence upon the increased returns to the municipality by reason of increased assessments and tax returns. Thus the effect of the Market Street elevated line upon the real estate values and development in West Philadelphia is being analyzed in detail. In this study the assessed valuation of every city block in the territory tributary to the existing elevated line is being chartered as of 1900, 1906 and 1912, as a precedent upon which partly to base a careful estimate which is being made of the probable increase in present realty values in the territory tributary to each new rapid transit line.

HEARING ON SALEM FARES

A hearing was given by the Massachusetts Railroad Commission at Boston on Oct. 30 upon the petition of the municipal authorities of the city of Salem for a reduction in fares between Salem and Lynn, on the through line of the Bay State Street Railway Company between Boston and Salem. The petitioners were represented by City Solicitor Sullivan and the railway company by its counsel, Bentley W. Warren, of Boston. The petitioners asked for the establishment of a 5-cent fare between Salem and West Lynn in place of the 10-cent fare now existing. The company took issue with this demand on the ground that the traffic was insufficient to afford a reduction and emphasized the expensive character of the line.

ELECTRIC LOCOMOTIVES UNDER SERVICE CONDITIONS

One of the most interesting features of the recent Chicago convention of the Association of Railway Electrical Engineers was an address delivered on Oct. 24 by Norman W. Storer, engineer Westinghouse Electric & Manufacturing Company, in relation to the present status of heavy electric traction.

Mr. Storer began by saying that the existence of the electric locomotive was responsible to some extent for the improvements in the steam locomotive which have been made during the last ten years. While the speaker was confident that the electrification of a considerable portion of the railways of the world should be accomplished at some time, still the improved steam locomotives had made it possible to postpone this tremendous change and study the problem deliberately. It was pointed out that electrification was usually accompanied by other changes and improvements which ought not to be charged up to it as a part of the capital expense. In the case of Chicago, where electrification of trunk-line terminals was a live subject for discussion, Mr. Storer said that the city would be ahead in the end if it waited until the railroad companies got together and found out what they could do under conditions of actual operating practice.

One thing that had been discovered in the use of electric locomotives was that the great problem was the transmission of the torque of the motor to the driving wheels. It was now generally believed to be poor practice to gear locomotive motors directly to the axles of the drivers except for slow-speed work, on account of damage by the shocks to the gear teeth as well as injury to the track from the low center of gravity.

The lecturer proceeded to discuss six types of electric locomotives, illustrating them with illuminated pictures—the New York Central "6000" d.c. gearless type; the original machines for the New York, New Haven & Hartford; the latest machines for the same railroad; the powerful high-speed electric locomotives for the Pennsylvania terminal tunnel in New York; the modern three-phase locomotives for the Italian State Railways, and the alternating-current locomotives for the Loetschberg tunnel in Switzerland.

Of these Mr. Storer said that the first type was an example of a locomotive built around one idea, namely, that of mounting the armature of the motor directly on the axle and building the motor field into the truck frame so as to do away with all motor bearings. It was a scheme ideal in its simplicity and it was not surprising that the New York Central desired to use it. However, it was well known that the locomotives had never been considered as successful high-speed machines on account of their tendency to nose, which destroyed the track. This type of electric locomotive had an extremely low center of gravity so that it was quick to feel the irregularities in the track and synchronous vibrations were very easily set up. A great deal had been done to eliminate this defect, but the efforts had been only partly successful.

The second type mentioned, that having the motor mounted on a quill surrounding the axles and connected through springs, was open to some of the same objections as the first type. This also had a low center of gravity, although considerably higher than the first type, but all weight was spring-supported so that the track did not get a direct blow. The original New Haven locomotives nosed badly at high speeds but were entirely cured by the addition of an idle axle at each end of the locomotive and a toothed-cam centering device between the cab and the trucks. These locomotives at present exhibited absolutely no tendency to nose even at the highest speeds—75 to 80 m.p.h.—where formerly they nosed at 50 to 60 m.p.h. However, even with the motors carried by springs, the track was liable to damage unless it was kept in good surface.

The third type, having motors mounted above and geared to quills surrounding the axles, was one of the latest developments, and the New Haven locomotives of this type were the easiest riding electric locomotives that had ever been built. Mounting the motors rigidly on the trucks above the axles and gearing down to the quills of course raised the center of gravity very considerably. Then the long helical springs connecting the quills to the driving wheels permitted the axles and journal boxes to move a total vertical distance of 3 in. in the pedestal jaws without the quills touching the axles. Thus the wheels were free to follow the inequalities of the track without disturbing the mass of the locomotive and consequently caused the least possible damage to the track. The arrangement of wheels, combined with the distribution of weight and the drive, entirely prevented nosing, and the secondary springs transmitting the weight of the cab to the trucks through the large surface plates prevented the transmission of vibration from the truck frame to the cab and made the cab ride like a Pullman car. This type of locomotive had been built both with a single motor per axle and with twin motors of the same total capacity per axle. After building a number of the former type with motors so large as to require double gears, it was found that the same output could be obtained with less weight and less cost by substituting two motors for the one large one. This arrangement had the advantages that only one gear was required, as both motors drive through the same gear, and that the two motors were lighter and easier to handle and cheaper to maintain than the large one, being also interchangeable, except for field castings, with the motors used on the New Haven multiple-unit cars. The two motors, being connected permanently in series, gave in effect one motor of double voltage and consequently half current, thus reducing the carrying requirements of cables and switches and making a substantial saving in the cost of control equipment.

Mr. Storer said that the gears on these locomotives had never given a moment's trouble. The spring drive had removed the bad effects of the inpact of the teeth when operating at a high speed, so that it was anticipated that the gear speed could be much higher than that of the ordinary gears mounted directly on the axles, and that by avoiding direct impact between the teeth the life would be greatly increased. The efficiency of such a gear drive was stated to be very high.

While these locomotives were built for single-phase operation, they would have practically the same advantages on direct current. The twin-motor scheme could be satisfactorily adapted to high voltage d.c. operation.

The fourth type of locomotive, that with motors mounted high up in cab and connected to drive wheels through cranks, parallel rods and a jackshaft, was the type adopted by the Pennsylvania Railroad for the New York terminal. This type had a very high center of gravity, and although the weight on driving axle was about 56,000 lb. and the springs were consequently stiff, the locomotive had excellent riding qualities, corresponding to the best steam locomotives. There was absolutely no tendency to nosing and no bad effects on the track. These were the most powerful electric locomotives ever built and had shown themselves to be wonderfully reliable, having a record of only thirteen train minutes' delay for the first year with thirty-three locomotives in service. They had actually developed over 75,000 lb. drawbar pull, corresponding to a crank pin pressure of over 100,000 lb. This was found to impose strains on the jackshaft bearings which were worse than in reciprocating engines. There was scarcely any neutral zone because of the combined action of the motor rods and driving-wheel rods set at an angle of about 45 deg. from each other. This angle, however, was much to be preferred to the vertical motor rods adopted for the first locomotives built for the German State Railways, which were practically failures. Locomotives of this type required very careful adjustment to maintain the shafts parallel and properly centered. Nevertheless, it was the type preferred by many railway men for high-speed work and would probably be used a great deal on account of the similarity to the steam locomotive both in design and performance.

The fifth type of locomotive, that employing the Scotch yoke for transmitting the power from the motors to the driving axles, had been used exclusively for the three-phase locomotives on the Italian State Railways. The first ones had been in service some ten or twelve years on the Valtellina line and had given excellent results. The later ones, some thirty-five in number, had been in use about two years on the Giovi line near Genoa. These machines had some excellent qualities—light weight, powerful motors and motor weight entirely spring-supported. They had, however, been used only in slow and moderate speed service, so that their performance at high speeds remained to be proved. These locomotives also required very accurate adjustment, although not so close as the Pennsylvania type, as the Scotch yoke drove one axle through a sliding block and the others through parallel rods connected to the yoke by knuckle pins. Spherical crank and knuckle pins were largely used with this type of drive.

The sixth and last type mentioned was the one driving the locomotives through a combination of gears and side rods or gears and Scotch yokes. A number of such locomotives had been built, the most notable being the ones built for the Loetschberg Tunnel in Switzerland and for the Midi Railway in France. The former had two 1000-hp motors, each connected by a helical tooth gear to a jackshaft, which was slightly above the driving axles, and thence by parallel rods to three pairs of driving wheels. Although the motor speed was extremely high, the gears operated practically noiselessly and with high efficiency. The duty on the jackshaft bearings was much easier than when side rods only were used, since the reciprocating pressures were practically all in a horizontal direction and could therefore be cared for much more easily. The Midi locomotive, built by the Société Anonyme Westinghouse, had two motors, each geared to a jackshaft through gears located outside the plate frames of the locomotive. The jackshafts were connected to the drive wheels through Scotch yokes like the Italian locomotive. Both of these types had a fairly high center of gravity and they were therefore susceptible of a design that would have excellent riding qualities.

The motors and gears were located above the springs, and the duty on the gears was less severe than if they were mounted on the axles. The jackshafts for side-rod drive, the author said, should be located in the same horizontal plane as the driving axles, consequently the problems connected with tramming and quartering and with bearings would be reduced to a minimum. In some respects this design was superior to either straight geared or straight side-rod types, and it was probable that a good many locomotives with gears and side rods would be built. Twin motors might be used, thus reducing the gears to the lowest number or to the least width of face.

In conclusion, the speaker said that all of the electric locomotives described, except those of the New York Central, which required direct current, could be operated with either direct current or single-phase or three-phase alternating current. In Europe the general belief was that alternating current should be used for heavy railroad practice, although in England there were some direct-current and some alternating-current installations. The choice, however, was determined by the amount of energy that could be taken from an overhead trolley. Perhaps 200 amp to 300 amp might be continuously collected in this manner.

In the discussion which followed the question was raised as to frequency, and Mr. Storer said that the practice in this country was to use 25-cycle operation, except in the

case of the Visalia (Cal.) line, where 15-cycle electric locomotives were in use. In Europe the frequency was usually 15 cycles or 16⅔ cycles.

DISCUSSION

W. A. Del Mar, assistant engineer New York Central Railroad, said that the New York Central Railroad had not been backward in appreciating the advantages of the single-phase system but had fully considered it in numerous estimates. These estimates showed that on short hauls where the traffic density is great the direct-current system is almost invariably cheaper, while on long hauls where the traffic density is slight the single-phase system is often cheaper.

In answer to a question Mr. Storer said that an electric locomotive would cost perhaps twice as much, or even more, than a steam locomotive of equal drawbar pull, but it would do twice as much work and be capable of longer runs and more continuous operation than the steam machine.

C. H. Quinn, assistant engineer Norfolk & Western, remarked that as the steam locomotive and the electric locomotive approached each other in size the first costs of the two types tended to approach also. The cost of maintaining steam locomotives, he said, was about twice that of maintaining electric locomotives.

ANNUAL CONFERENCE OF THE MUNICIPAL TRAMWAYS ASSOCIATION OF GREAT BRITAIN

The Municipal Tramways Association, composed of representatives of the municipal street railways in the various cities of Great Britain, held its eleventh annual conference at West Ham on Sept. 25-27, 1912. The conference was opened by the president, H. E. Blain, manager West Ham Tramways, with an address to the members, giving a review of the year's work of the association and covering matters of general interest to the British street railways.

PRESIDENTIAL ADDRESS

Mr. Blain called attention to the fact that while the committee on rail corrugation had not been able to arrive at definite conclusions as to the producing cause or causes of corrugation or as to a satisfactory remedy for it, its extensive and very thorough experiments had produced results which should assist materially in the final solution of the problem. A striking difference between the findings of the committee and a theory advanced by Continental investigators arose on the question whether corrugation was inherent in or external to the rail. The committee was of opinion that, while a steel for rails could be obtained which was more durable and less liable to the development of corrugation than the ordinary varieties of steel, the chief cause or causes would be found to be external to the rail itself.

He said that the London County Council fight on the question of trailer tramcars was somewhat perplexing, probably, to those whose labors were not expended in the Metropolitan area. The Board of Trade (which was the sole governing authority in regard to electric traction so far as the rest of the country was concerned) was willing to sanction an experimental use of trailer cars, as it had done on several provincial tramways, but the Metropolitan police had refused to continue to license the vehicles to be used for the purpose of such experiment, a step which, having regard to European experience, was noted with profound astonishment. As a result of parliamentary consideration of the matter, the London County Council had obtained powers sufficient to enable this interesting expedient for the conveyance of the public during rush hours to be tested satisfactorily. He condemned the proposed erection by the national post office of bare overhead telephone wires, which he said were admittedly a danger, obstruction and eyesore, both by their own presence and their resultant increase in guard wires over trolley wires; and many large cities and areas had been entirely freed from such overhead wires. The association's executive council was making a strong protest, the postmaster general had been asked to receive a deputation upon the matter, and parliamentary attention might be directed to it.

The insurance act of 1911 had brought onerous financial responsibilities for tramway undertakings, and in the uncertainty of the application of its section on unemployment the association had been prominently represented before the umpire appointed to decide the different grades of workmen on whose behalf contributions against unemployment were required. Although the decisions given, so far as they relate to tramways, might be regarded as not unsatisfactory, it was to be regretted that, in the drafting of the act itself, some more defined and coherent basis governing the trades affected should not have been adopted. Mr. Blain also expressed the indebtedness of all tramway undertakings to the Light Railways & Tramways Association for its help in connection with the rating case. A reduction of the assessment on tramways to one-fourth of the general district rate was an instalment of justice for which all were eminently grateful.

With regard to motor bus competition with street railways Mr. Blain said that in the Metropolitan area the tramway undertakings had to face an exceedingly keen motor bus competition, which selected only such routes as were of a distinctly remunerative character. To take the question of street widenings alone, many of the thoroughfares would have become impossible for use by the motor buses and the ordinary vehicular traffic if it had not been for the expenditure upon them from tramway funds. The same funds bore annually thousands of pounds of road maintenance costs for which tramways were responsible only to a fractional degree, and their expenditure in this direction had been enormously added to by the destructive effects of motor bus traffic. The speaker recognized the rights of private enterprise and the exceedingly valuable traffic facilities which had been furnished by motor buses in many areas, but could not see why, of all the users of the public highway, tramways alone should be called upon to pay so unfair a proportion of road maintenance. If competition was to exist on the public highway for the conveyance of the public, all such means of traction should pay a proportionate cost of road maintenance, should be rated on similar lines, and should be governed in the conduct of traffic by similar public regulations.

MUNICIPAL OPERATION

S. T. C. Neumann, deputy chairman Bradford Corporation tramways committee, then read a paper entitled "Tramway Administration by Municipalities: a Retrospect and a Forecast." He referred to the rapid municipalization of street railways in Great Britain and pointed out some of the political drawbacks to municipal administration. Among them, the political candidates for office would make promises during campaigns of changes in the service which after the candidates were elected were often found to be impracticable and detrimental to the welfare of the community. The greatest sufferer was, of course, the tramway department. It was also common to find candidates for election bidding for popularity by promises of universal half-penny fares and other concessions of like character. Again, the ever changing personnel of the authorities deprived the tramways of the continued attention which was necessary for their success. The speaker believed that the proper way was that the tramway manager, who was a permanent officer, should have very large powers and that the municipal authorities and "tramway committees" should be invested with only limited power. Otherwise municipal operation would not hold its own against keen and businesslike competitors. One important advantage of municipal ownership

was the aid which the tramways could give to the development of the city in different directions. Under private control similar good work could be accomplished, but private ownership must have chief regard to dividends, and while profits no doubt had weight also with municipalities this end had never had undue precedence over considerations of public welfare.

Municipal tramways were not free from labor problems or from unions. At elections the unions exercised an important influence, and complaint was common that some of the employees regarded the tramways as run entirely in their interests. The knowledge that a considerable amount of political pressure or influence could be brought to bear on the tramway committee and the management by the employees had created a spirit of independence and a tendency on the part of the employees to pay less regard to the interests of passengers. Managers were also hampered by being urged to employ men recommended by members of their tramway committee who frequently knew very little of the applicants themselves. Another difficulty under which the municipal tramway systems labored was that city officials anxious to make a telling financial record were prone to milk the tramway system and appropriate any pecuniary balance capable of any such appropriation to reduce the taxes. The more an official could "hypothecate" the tramway funds the better "chancellor" he was considered to be, and he often did so without even consulting the manager or the committee concerned. This not only starved the undertaking but often brought about a more serious condition of affairs by preventing necessary renewals and maintenance. There were other ways, however, in which municipal tramways were peculiarly susceptible to financial attack. One was in the matter of damage claims. Some people appeared to believe that if they suffered the slightest mishap or accident there was a moral responsibility upon the town to compensate them, no matter how remote the connection with the accident. It was now generally recognized by municipal tramway managers that all claims should undergo searching examination, but undoubtedly there was a generosity in dealing with claims which would not perhaps be found in a private undertaking.

Applications for concessions by the tramway systems to different bodies or classes of citizens were also of too frequent occurrence. Thus, while the speaker sympathized with the idea that those who suffer from blindness were entitled to the utmost consideration, the privileges given to them by the tramway system were utilized as a precedent for preferring all manner of similar claims by other classes of citizens. It was difficult to know where to draw the line, and conductors were hampered and confused by the various regulations made in the interest of different sections. This was a serious loss of legitimate revenue to the department. Those responsible for considering these claims should act very warily and not grant them in haste to repent at leisure. Often concessions became, in process of time, vested interests, and here the smaller undertakings had to follow the example of the larger.

TRAMWAY FARES AND THEIR BASIS

A paper on this subject was then presented by William J. McCombe, tramway manager Corporation Tramways, Hull. The speaker brought out the fact that among the British municipal tramways two policies prevail. One was to make the tramways self-supporting and thus earn a profit; the other was to keep the fares low and not to charge passengers the average cost of their rides. There was, therefore, no systematized and recognized arrangement of fares by municipalities, and there seemed to be insuperable difficulties to such a general policy. On most tramway committees there was a conservative section and a progressive section. They never agreed on the question of fares and were not likely to agree, as their standpoints were entirely different. The result was usually a compromise, which gave satisfaction to neither.

In the old horse car days the twopenny fare was considered the mainstay of the system. Then the penny fare became popular. It had not an inherent quality in itself, but experience had shown it to be the most reasonable and proper charge for a certain length of ride. Now the half-penny fare was being advocated and had been introduced in some cities. No one could argue that the half-penny fare was desirable on all systems, but under some circumstances it could be introduced with safety. Fares were necessarily based upon the theory of averages, and it was impracticable to try to make each passenger pay the cost of his ride and receive full value for his money. Strictly speaking, passengers must sometimes pay more than the value of their ride and other times less. The speaker then presented several tables, of which one is reproduced, containing information about fares in operation on various municipal tramway systems in Great Britain.

AVERAGE FARES CHARGED IN PENCE PER MILE ON MUNICIPAL TRAMWAY SYSTEMS.

Fares per stage:	½d.	1d.	1½d.	2d.	2½d.	3d.	3½d.	4d.
Aberdeen	1.278	.594	....	.538	....	....	....	....
Accrington	....	.928	....	.922	....	.676	....	....
Ashton-u.-Lyne	.882	.912	....	....	....	....	....	....
Ayr	.87	.957	.822	.904	1.03	1.	....	....
Belfast	....	†.198	....	.397	....	....	....	....
		*.51						
Birkenhead	.835	.719	.784	.623	....	....	....	....
Birmingham	....	.427	.487	.486	....	....	....	....
Blackburn	....	.8	.86	.8	....	.75	....	....
Blackpool, Summer	....	1.	.882	1.07	....	1.11	....	.8
Blackpool, Winter.	....	.537	....	.909	....	....	....	....
Bolton	....	.682	.632	.522	.623	.615	.713	.623
Bournemouth	....	.83	1.1	.909	....	.833	....	.855
Bradford	....	.617	....	.571	....	.6	....	.571
Brighton	....	.787	.893	.904	....	....	....	....
Burnley	....	.8	.857	.8	.833	.857	....	....
Burton-on-Trent	....	.664	.674	.656	....	....	....	....
Bury	....	.781	.807	.729	.735	....	....	....
Cardiff	....	.694	.753	.735	.749	.75	.732	....
Chester	....	.787	....	.8	....	....	....	....
Chesterfield	....	.725	.728	.772	....	.831	....	....
Colchester	.505	1.12	1.15	1.31	1.23	1.06	....	....
Croydon	....	.447	....	.47	....	.542	....	....
Darlington	.923	.88	....	....	....	....	....	....
Darwen	....	1.	1.	1.33	....	....	....	....
Derby	....	.784	.81	.744	....	.727	....	....
Doncaster	....	.769	.697	.66	....	....	....	....
Dover	....	.5	....	.615	....	....	....	....
Dundee	1.	.5	....	....	....	....	....	....
Exeter	....	1.014	1.	.973	1.01	....	....	....
Glasgow	.43	.433	.433	.432	.43	.43	.44	.45
Gloucester	....	.644	.718	.638	.677	.7	....	....
Gt. Yarmouth:								
Summer	....	1.	....	1.	....	1.	....	1.032
Winter	....	.666	....	1.	....	1.	....	1.032
Halifax	1.43	.74	....	.803	....	.804	....	.792
Heywood	....	.97	1.035	.949	.963	.822	....	....
Huddersfield	....	.722	.731	.729	.707	.715	.719	.61
Hull	†.182	*.364	....	....	....	....	....	....
Ilkeston	.943	.606	.48	....	....	....	....	....
Ipswich	....	.671	.75	.654	.706	.75	....	....
Keighley	.46	.46	....	....	....	....	....	....
Kilmarnock	1.07	.88	.86	1.01	....	....	....	....
Kirkcaldy	.629	.657	.649	.633	....	....	....	....
Lancaster	....	.585	....	....	....	....	....	....
Leeds	1.	.5	.6	.5	.55	.5	.538	.5
Leicester	....	.46	....	....	....	....	....	....
Leith	1.29	.759	.828	.816	.786	.777	....	.662
Lincoln	....	.558	....	....	....	....	....	....
Liverpool	....	.408	....	.445	....	.471	....	.479
Lowestoft	....	.8	....	.76	....	....	....	....
Manchester	....	.395	.391	.631	.6	.581	.572	.56
Nelson	1.	1.	1.189	1.209	....	....	....	....
Newcastle	.316	.633	.658	.628	.637	.647	.651	.672
Newport	....	.6	.916	.696	....	....	....	....
Northampton	.374	.748	.833	.781	....	....	....	....
Nottingham	....	.595	.622	.603	.625	.635	.641	....
Oldham	....	.897	.942	.947	.95	.732	....	....
Perth	1.144	1.043	....	....	....	....	....	....
Portsmouth	....	.625	....	.689	....	.631	....	....
Preston	1.2	.98	1.044	.97	....	....	....	....
Rawtenstall	....	.856	.878	.914	.934	.942	.898	.81
Reading	....	.629	....	.741	....	....	....	....
Rochdale	....	.926	.963	.933	.957	.955	.95	.954
Rotherham	....	.862	.74	.63	....	....	....	....
Salford	....	.54	.528	.592	.591	.6	.567	....
Sheffield	1.	.4	.49	.527	....	....	....	....
Southend	.694	.709	.735	.735	....	....	....	....
Southport	.725	.625	.732	.848	....	....	....	....
South Shields	....	.55	.56	....	....	....	....	....
Stalybridge	.934	.832	.829	.819	.806	.77	.746	....
Stockport	1.025	.755	.76	.742	.758	.684	....	.588
Sunderland	....	.746	.785	.668	.637	....	....	....
Swindon	....	.83	.888	.83	....	....	....	....
Wallasey	....	.503	....	.559	....	....	....	....
Walsall	....	.806	.707	.772	.762	.797	....	....
Walthamstow	.794	.877	.872	.809	.943	.92	....	....
Warrington	1.587	.802	1.07	....	....	....	....	....
Wigan	....	.871	.871	.843	.75	.799	....	....
Wolverhampton	....	.856	.892	.994	.984	....	....	....
York	....	.751	.8	.83	.774	.808	....	....

*After 9 a.m. †Before 9 a.m.

NOTE.—Systems in the Metropolitan area which have inter-running operations have been left out of the tables.

Report on Cincinnati Traffic

The Report Discusses the Peculiar Topographical Conditions in Cincinnati, Methods of Analyzing Its Traffic Movement, the Loading of Cars, the Riding Habit, the Peculiar Problems of Congestion and Proposed Methods of Re-routing

The investigation of R. W. Harris, of Madison, Wis., in regard to traffic conditions in Cincinnati, Ohio, has been mentioned in previous issues of the Electric Railway Journal. The completed report on this subject contains the results of studies covering various conditions bearing on the service rendered, including comparisons with other systems, principally in the West.

In his discussion of general conditions Mr. Harris says in part:

"The effect of a transportation system on any individual citizen varies according to the particular aspect of it in which he is especially interested. The existence of these various points of view often results in arousing controversies and strife of various degrees of intensity. However, an efficient, co-operative and conservative, yet liberal, plan of developing transportation facilities is ultimately best for all concerned.

"Whatever the detailed history of traffic conditions may be, in most cases there exist inefficient operation, routing, service, and often mismanagement, as well as strained relations between the various interests affected. A correction of these evils is necessary. The situation will eventually resolve itself into the problem of a scientific balancing of the service given and the demand for it."

TOPOGRAPHICAL CONDITIONS

Regarding the striking topographical and other conditions existing in Cincinnati, the report says in part:

"A cursory study into the city's history shows that when the site of the early settlement was chosen it was thought that the wide basin sheltered by surrounding hills would afford ample room for future growth. It did not, however, and when the growing city began to break beyond the rim of the hills it was readily brought out that there were only a few breaks between the hills that could be used as avenues of egress from the basin below. These few thoroughfares became the only outlets for the modern transportation conveniences. The construction of inclined planes to the top of some of the more abrupt hills was a secondary development. These inclines cannot be considered as affording a means for through traffic on account of their mechanical limitations, and there are left only a few valleys between the hills as arteries through which transportation facilities can be provided.

"There was not much thought of the future when the streets were laid out. Narrow streets with frequent offsets, sharp turns and crowded traffic conditions are to be attributed to the failure to foresee future necessities on the part of those who laid out such cities.

"In many of the older cities great amounts of money have been spent in widening streets and providing boulevards, and Cincinnati has begun the working out of an extensive plan of the same nature. The work has taken the direction of parkways and boulevards connecting outlying residential sections, and this does not help to work out the transportation problem.

"The recommendations made are such as it is believed, if adopted, will adapt the local system to present needs and leave room for much future growth. The successful working out of the plan depends on the co-operation of all, and the recognition of the fact that in a local transportation problem the interests of the people—the municipality standing for the people—and the company are mutual and not antagonistic."

OBSERVATIONS REGARDING TRAFFIC

The method of observation adopted is described in part as follows:

"Representative round trips have been made on each line in each of the representative periods of travl during a day. This includes a round trip during the morning, noon and evening rush periods of travel, as well as similar trips during the lean hours of travel, including the morning, afternoon and late evening. In order to obtain accurate and reliable information regarding these trips the inspector was stationed on the car and a note was made of the movement of every passenger using the line as well as the movement of the car itself.

"From the information thus collected it was noted that, owing to the distribution of the density of population along the line and to the class of territory served, the use of the line divides it into what may be termed 'characteristic sections.' In any one section the rate of change of loading is practically constant; it may increase, decrease or remain constant in amount. The point where this rate noticeably changes represents the point of division between adjacent sections. If all cars passing this point throughout the day are observed in such a manner as to indicate the arriving and leaving loads, etc., the conditions of traffic existing at the end of one section and at the beginning of the next section can be obtained. This point has been termed a 'characteristic point.' Owing to the fact that the distribution of traffic along the line varies during the rush and lean periods of travel, a corresponding difference in the number of characteristic sections occurs. It is necessary, therefore, to consider a number of round trips taken at different times of the day, in order that all characteristic points may be determined.

"The use of line as indicated by the representative trips shows the line to be divided into what has been termed 'major characteristic sections.' Each line is divided into three parts, viz., a section devoted to the receiving of passengers in which practically the entire load is received, a section in which the load changes very slightly, and a section in which the load is discharged. These have been termed, respectively, the receiving, neutral or transmission, and dischargal districts.

"Unfortunately, from the point of view of the operator of an electric traction system, the distribution of load throughout the day is not uniform as to time of occurring, amount and direction of travel. When the loads are maximum at all times of the day in one direction they are most likely minimum in the other direction. The service in addition to being adequate to accommodate the passengers during the rush hours must also possess a readiness-to-serve feature during lean hours of travel.

"A series of observations was made of each car on each line going in each direction at every time of the day. This information has been compiled in diagrammatic form. From these diagrams the duration of the various times of travel has been noted, with the result that the entire day's operation has been divided into periods as follows: Periods 1, 2 and 3 represent the morning, noon and evening periods, while A, B, C and D represent the morning, afternoon, night and late night lean periods of travel.

"The relative importance of these periods of travel can be noted when it is considered that 24 per cent of all the traffic occurs during the morning (period 1); 13 per cent during the noon period (period 2), and 26 per cent during the evening period (period 3). The average times of duration of periods 1, 2 and 3 for all lines are respectively 3.1, 3.1 and 2.3 hours. The average duration for all regular daily service for all lines, not including 'owl' service, is 19.3 hours. From this it is evident that only 37 per cent of

the traffic occurs in the 10.8 hours of lean service. Slightly more than 50 per cent of the traffic occurs during periods 1 and 3, a duration of 5.4 hours.

"In the case of Cincinnati more than 50 per cent of the travel occurs during the morning and evening hours. The noon traffic is 13 per cent of the total of all day traffic, an unusually small amount.

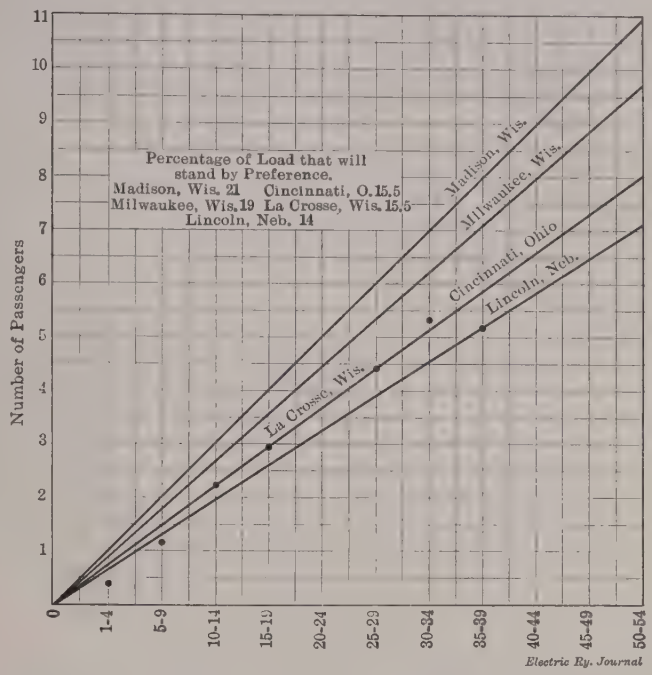
LOADING OF CARS.

"Heretofore there has not been any definite standard fixed scientifically by traction companies to be used in determining whether or not service is sufficient. As a matter of fact, a standard has been fixed arbitrarily in each case and is more or less subjected to the opinion of the operator. In some instances city councils have instituted a form of regulation by arbitrarily limiting the maximum allowable load and instituting unwise restrictions almost impossible to meet on account of unavoidable and unforeseen fluctuations of traffic demand.

"As a result of studying scientifically traffic conditions in a number of cities and balancing the amount of service given against the amount of service demanded, the definition of what is known as a 'comfortable load' has been derived and represents a standard of good service. A comfortable load is such that every person under average normal conditions who desires a seat may have one, while those who desire to stand of their own initiative may stand comfortably.

"The experience gained from studies indicates that there is a well-defined law governing the relation existing between the load and the number of preferential standers, such as smokers, fresh-air enthusiasts, etc. The number of preferential standers for any given load is peculiar to the conditions existing in each locality. As may be seen from the accompanying diagram, in Madison, Wis., 21 per cent of any load will stand by preference; in La Crosse, Wis., 15.5 per cent; in Lincoln, Neb., 14 per cent; in Milwaukee, 19 per cent, while in Cincinnati 38,000 observations indicate that 15.5 per cent of any load may be expected to stand by preference.

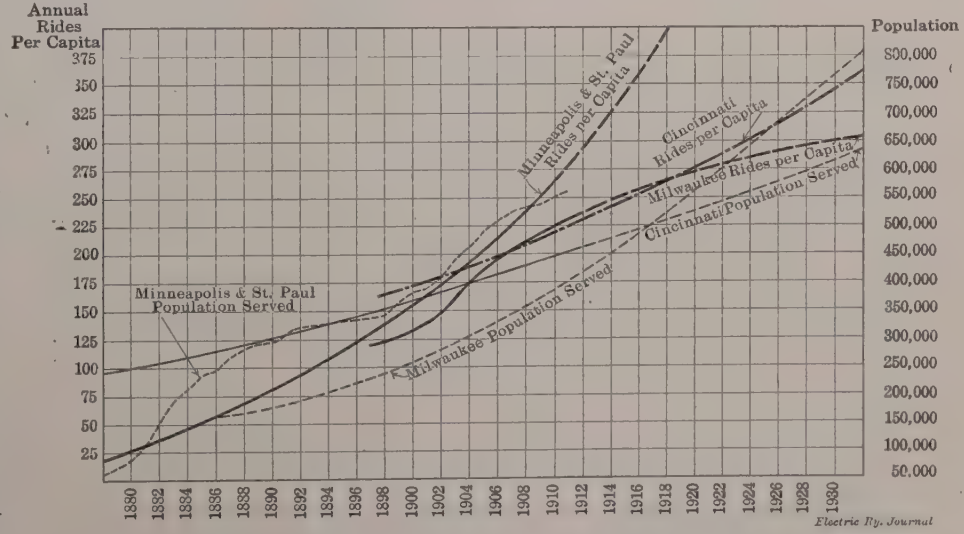
"In arriving at the data upon which this diagram was constructed no observation was considered when there was not room for every person on the car to be seated. The average number of people observed standing on a large number of cars was determined for loads ranging in size from one to four passengers, after which a similar computation was made for loads ranging in size from five to nine passengers, ten to fourteen passengers, etc. A similar average was obtained for a large number of loads ranging in size from five to nine passengers, as well as all other degrees of loading. These averages, each being determined independently of all others, were plotted to scale in the form of a curve, from which it was observed that on the whole the number of preferential standers bears a definite relation to the loading of the car as mentioned above.



Cincinnati Report—Percentage of Passengers Who Will Stand by Preference

"The degree of loading often fluctuates from causes beyond the control of the operator of a system. As a result of special studies in various cities, the space into which patrons will crowd themselves under conditions of this kind has been determined. In Minneapolis a large number of observations indicate that standing passengers will arrange themselves into an average of 2.5 sq. ft. per passenger in the rear vestibule, 6.4 sq. ft. in the rear aisle and 12.9 sq. ft. in the front aisle. Each of these results has been determined from observations of standing loads when there was available standing space in other parts of the car.

"Considering the car as a whole, the test shows that one person will stand comfortably, when forced to do so, in 4.3 sq. ft. A similar result was obtained by a study of Milwaukee, Wis., and Lincoln, Neb., conditions. Owing to the type of car and the operating rules of the Cincinnati Traction Company, it was impossible to obtain satisfactory data in Cincinnati. However, considering the conditions as a whole, it is believed that an allowance of one standing passenger for 4 sq. ft., when the total available standing space of the car is considered, is fair and in accordance with the conditions."



Cincinnati Report—Rides per Capita in Different Cities

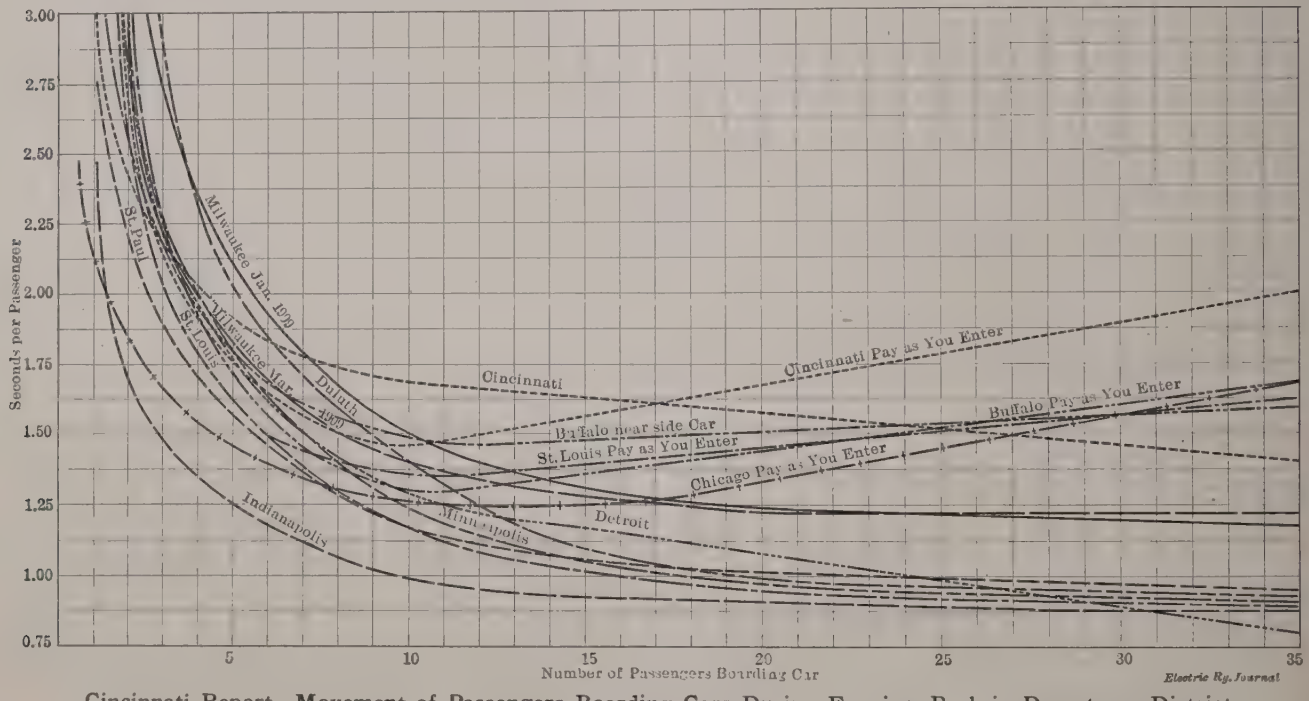
RIDING HABIT AND RATE OF INCREASE

A diagram in the report, which is reproduced herewith, gives the results of studies in various cities. The report says: "In Minneapolis and St. Paul from 1890 to 1900 the riding habit (rides per capita per annum) increased approximately from 80 to 153, an increase of 73 rides per capita per annum, or 91.5 per cent, while the population

served increased from 300,000 to 375,000, an increase of 75,000, or 25 per cent. From 1900 to 1910 the riding habit increased to 260, an increase since 1900 of 70 per cent, while the population served increased to 550,000, an increase of 175,000, or a trifle less than 47 per cent.

"In Milwaukee the estimated riding habit in 1890 was approximately 100 rides per capita per annum. In 1900 these rides had increased 35 per cent to 135 and in 1910 to approximately 215 rides, an increase of 59 per cent since 1900. The corresponding increase in population served was from, roughly, 180,000 in 1890 to 260,000 in 1900 and 380,000 in 1910, an increase for each decade of 44 and 46 per cent respectively.

"In Cincinnati the riding habit increased from approximately 150 rides in 1890 (estimated) to 173 rides in 1900 and to 225 rides in 1910, while the population served increased from 300,000 in 1890 to 370,000 in 1900 and approximately 450,000 in 1910. The percentage of increase in the riding habit in Cincinnati has been 15 and 30 per cent respectively for the two decades, while the increase in population has been 23 and 22 per cent respectively. These figures indicate that the riding habit at present is developing more rapidly than the population served. This may be due to a number of causes. Probably the most important factor affecting the increase is the development of a desire on the part of the people to live farther from the center of the city and enjoy the benefit of cheaper property and more comfortable residence locations."



Cincinnati Report—Movement of Passengers Boarding Cars During Evening Peak in Downtown District

PASSENGERS AND EQUIPMENT

A section of the report dealing with passengers and equippment says in part: "The number of passengers in Cincinnati has increased, in round numbers, from 66,000,000 in 1901 to 101,500,000 in 1911, an average increase of 5.4 per cent annually, while the earnings have increased approximately from $3,450,000 in 1902 to $5,100,000, an average increase of 5.34 per cent per annum.

"The demand for service during the one and one-half hours (5 p. m. to 6:30 p. m.) of evening rush, as measured by the amount of travel (in and out) during this period, has been increasing at an average rate of 5.3 per cent since 1901. The total seating capacity of the equipment available for winter service has increased at a rate of 5 per cent per annum, while the total comfortable load and total maximum standing capacity have increased 5.8 per cent and 7.1 per cent respectively. It follows that on this basis of comparison the increase of seating capacity has been at practically the same rate as the demand, while the comfortable load and standing capacity are increasing at greater rates. The fact that the standing capacity is increasing faster than either the seating or comfortable load capacities indicates that the general trend of the design of cars is along the line of accommodating a larger number of standing passengers rather than favoring the comfortable loading of cars.

"The facts entering into the Cincinnati conditions are not unlike those to be found in other cities. Data in this connection, however, are difficult to obtain, although the investigations conducted on plans similar to those used in making this investigation indicate similar conditions to exist in many localities."

A comparison (published in Table I) of the amount of service given in various cities, measured by the car miles operated per mile of track, etc., is qualified by the statement that such a comparison "will often lead to erroneous conclusions, and, from the point of view of service, is not a fair basis of comparison."

Table I.—Comparative Operating Statistics for Various Cities.

City or Company.	Car Miles Operation per Mile of Track.	Revenue Passengers per Mile of Track.
Minneapolis-St. Paul:		
1911	63,228	384,000
Public Service Corporation, N. J.:		
1911	56,124	341,000
Milwaukee:		
1908	50,000	310,000
1909	49,500	308,000
Montreal:		
1908	102,500	655,000
Detroit:		
1911	49,248	234,000
Cincinnati:		
1911	93,000	440,000

One table was compiled to indicate the percentage of total traffic as observed at representative points of maximum loading for each line between 5 p. m. and 6:30 p. m. A summary of this table indicates that there were observed during the entire day 215,580 passengers, of whom 14.8 per cent were out-bound and 5.4 per cent in-bound, or a total of 20.2 per cent of the entire traffic, from 5 p. m. to 6:30 p. m., while 79.8 per cent travel at other times of the day.

The average evening rush period for all lines taken together was two hours and twenty-two minutes.

SEMINARY ROOM.

CONGESTION

The subject of "Congestion" is discussed in the report in part as follows: "The length of service stop has an important bearing upon this problem. In order to ascertain and analyze the extent to which conditions may be improved in this connection a study has been made of operating conditions in various cities.

"An accompanying diagram contains the results of a number of studies and in every case has been compiled from data observed under similar conditions of operation from the street and with stop watches in Milwaukee, Minneapolis, Indianapolis, St. Louis, St. Paul, Duluth, Buffalo, Chicago and Cincinnati. In every case it is apparent that when there are less than ten people who desire to board the car at the same point the time required per person increases as the number of passengers who desire to board decreases. For example, in Indianapolis when ten people desire to board the car it requires one second per person and in the case of five people one and three-quarters seconds per person.

"When a larger number than ten people desire to board the car at one point it has been observed that there exists a marked difference in the time required per person. For example, in St. Louis it requires one second per person with the ordinary type of car and a trifle less than one and one-half seconds per person when the 'pay-as-you-enter' type is used. In Cincinnati the results indicate for the same number of people that, with the ordinary type of car, one and four-fifths seconds are required per person as compared with one and three-quarters seconds per person when the 'pay-as-you-enter' car is used. In other words, as the number of passengers who desire to board the car at one point increases above ten the time required per person to board decreases for the ordinary type of car and increases with the 'pay-as-you-enter' car. The result is that the 'pay-as-you-enter' car increases the length of service stop and hence reduces the capacity of the tracks or number of cars per hour which can be operated past one point conveniently, thus decreasing the speed with which passengers may be moved from the central to the dischargal district. These conditions are most noticeable and effective in the down-town district during the time of greatest congestion, when the greatest efficiency of transportation is desired.

"Considering the relative movement of passengers in the various cities, it is noted that when twenty people desire to board the ordinary type of car in Indianapolis, Minneapolis, St. Louis, St. Paul and Detroit it will require approximately one second per person. In Milwaukee it requires one and one-quarter seconds per person, while in Cincinnati it requires approximately one and four-fifths seconds per person; that is, the 'velocity' of passengers in Milwaukee is 25 per cent slower than in the other cities mentioned, while in Cincinnati it is 60 per cent slower. Under similar conditions, then, the length of an average service stop in Cincinnati during periods of congestion is much greater than in Milwaukee and still more so than in the other cities mentioned.

"The increase in the time required for a person to get on a car in Cincinnati over and above that required in other cities may be attributed to a number of causes. The width of the streets is an important factor. In cities like Indianapolis and Minneapolis, where the streets are wide, passengers upon seeing their car assemble at a point in the street near the track and by the time the car stops they are closely grouped and will board with little loss of time. In cases where the streets are narrow the passengers assemble on the curb and in many cases wait until the car has come to a full stop before they proceed to board, thus increasing the space intervening between them, with a resultant increase in the time required to enter the car.

"A study has been made of the various factors which cause delay to the movement of cars over special work, etc. These observations have been made with stop watches and are shown in Table II.

"The type of car, so far as concerns providing sufficient space for the passengers to proceed readily into the car body, affects this rate. The readiness with which passengers board their cars is also a function of the amount of co-operation the public will give.

"Under favorable conditions it is possible to operate as many as 180 cars per hour past any given point in one direction and on the same track. There is doubt, however, as to the advisability of designing a schedule or routing

TABLE II.—ELEMENTS OF OPERATION CAUSING DELAYS.

Item.
1. Car ahead taking curve to right.
2. Car ahead taking curve to right with one from right.
3. Car ahead taking curve from right in nearest quadrant.
4. Car ahead taking curve to left.
5. Car heading in on curve from right.
6. Car heading in on curve from right with one from opposite direction to right.
7. Car making from opposite direction to right.
8. Car heading in from left.
9. Car ahead hesitating at point of switch.
10. One car crossing at right angles.
11. Two cars crossing at right angles.
12. Car ahead changing trolley.
13. Delay due to vehicular and pedestrian traffic.
14. Delay due to hesitancy of motorman and supervisor.
15. Delay due to other causes.

Observed Delay Due to Various Items Mentioned Above.

Item No.	Total Seconds.	Number of Observations.	Average Seconds.	Maximum Seconds.	Minimum Seconds.
1	772	96	8	13	4
2	23	2	12	13	10
3	142	11	13	20	8
4	142	21	7	12	5
5	833	82	10	18	6
6	...	..	..	..	7
7	40	5	8	19	7
8	423	39	11	20	2
9	22	6	4	6	5
10	1157	133	9	15	7
11	115	9	13	16	2
12	328	54	6	13	2
13	80	10	8	18	..
14	...	..	6	..	..
15	...	..	2	..	..

cars on this basis. If good service is to be given, running time reduced and distortion of scheduled headway prevented, it is not advisable to expect to move more than 130 cars per hour past a given point on one track and in one direction, taking conditions as they come. Experience in making studies of this character shows that the above capacity can be exceeded to a safe maximum of 180 cars per hour, in which case there must be no delays occasioned by vehicles, etc., and length of stops must not be longer than ten seconds."

PLAN FOR RE-ROUTING

A comprehensive plan of re-routing is recommended. In this connection Mr. Harris says:

"The ideal scheme of routing, assuming favorable conditions with respect to symmetry of general layout of the city, population, etc., would require all lines having contact with the central dischargal district to be through town lines, the halves of the lines being balanced with respect to territory, time and volume of traffic, direction of travel and characteristics of the people served. Manufacturing and other sections employing laboring people should be connected directly to sections in which the employees live. These lines should radiate from the central dischargal district and operate in conjunction with cross-town lines at various distances from the center of town depending upon the demand for service, thus making it possible for a passenger from any part of the city to transfer to another part of the city by way of cross-town lines without being subjected to the delays incident to traversing the central dischargal district.

"It is doubtful if there exists a city in which an ideal system of surface transportation, in the strictest sense of the term, can be operated. Cities are usually located on a river bank, the shore of a lake, in a cluster of hills or in some other similar district where the general topography will not permit of a single symmetrical scheme of routing.

"Every line now in operation in Cincinnati is a natural growth occasioned by political influences, reorganization, consolidation of lines, etc., and presents conditions not common with those of any other lines. There are cases where

through routing could be operated under difficulties, but, considering the conditions as a whole, a system of surface transportation embodying primarily a combination of 'stub lines' with 'cross-town lines' is more practical. It is hardly advisable with the present type of standard railway traction equipment to operate lines having exceptionally steep grades in conjunction with lines having more favorable conditions, for the equipment that will maintain a satisfactory speed on the level section will hardly maintain a satisfactory speed over steep grades.

"We have the lines radiating from the center of the city classed as short-haul, medium-haul and long-haul lines. In many cases the short-haul lines operate practically their entire length on the same tracks used by the long-haul cars. On account of the conditions the Cincinnati traveling public has unconsciously and to a marked degree established a habit of selecting between long-haul and short-haul cars. The majority of users of short-haul cars board them in preference to the long-haul cars. This peculiar feature establishes three distinct demands for service, viz., short-haul service, medium-haul service and long-haul service.

"Under such conditions the facility for handling traffic and the quality of service will be greatly improved by separating the routes serving the long-haul passengers from those serving the short-haul passengers. In the case of Cincinnati the peculiar topography and lay-out of the streets make it feasible to operate a scheme of this kind.

"It is hardly possible to determine accurately the number of cars for comfortable load conditions, assuming that all cars do not operate to the extreme end of the line, without first designating a complete running schedule for each line However, it has been estimated, with a reasonable degree of accuracy, that the number of cars required under these conditions would be approximately 8 per cent less than that necessary if all cars were operated to the extreme end of the routes."

KENTUCKY CARS IN CINCINNATI

The report takes up the effect of the operation of cars from the Kentucky side of the Ohio River in the downtown district of Cincinnati. On this point it says in part:

"During the rush hour of travel when a few minutes' delay occurs it seriously affects the operation of the Cincinnati cars. Since the carrying capacity of tracks needed for the operation of Cincinnati cars is occupied to a considerable extent by Kentucky cars, and further, since there is considerable delay to the movement of Cincinnati cars occasioned by the Kentucky cars, good service from the point of view of Cincinnati traffic will require a segregation of the two systems of cars."

On the subject of headway the report says that a distortion of 20 per cent represents a fair average of operating conditions.

AMOUNT OF DATA COLLECTED AND COMPILED

A paragraph in the report says on this subject: "A special effort has been put forth in making this investigation to base all conclusions on facts, and to that end approximately 6,000,000 observations of various kinds have been made and compiled in 155 diagrams, 629 summary data sheets and thirty-six large tables. The diagrams range in size from 8½ in. by 11 in. to 22 in. by 15 ft. and have a total area of 1500 sq. ft. In addition to the diagrams and tables, there are 200 pages of typewritten discussion."

Attention has been called to the fact that in traction power houses, where for about three hours in the morning and in the evening it is necessary to develop twice as much power as during the rest of the day, plants which are equipped to burn oil have no difficulty in developing double the normal rate of temperature for each boiler regardless of draft conditions. In some plants where coal is ordinarily used as fuel the boilers carry the peaks by using a combination of oil and coal.

CHICAGO HARBOR & SUBWAY COMMISSION SUPPLEMENTAL REPORT

The Harbor and Subway Commission of the city of Chicago presented a supplemental report to the local transportation committee of the Chicago City Council on Oct. 30, replying to the numerous criticisms which have been offered in the public hearings being held before the committee since the original report was presented. In refuting the criticisms presented the commission divided the objections into five groups. These groups are as follows:

(1) That Chicago can obtain genuine rapid transit without a comprehensive system of passenger subways by improving and extending the existing means of transportation, or, in other words, that Chicago's present and future traffic can be properly cared for by bringing the surface and elevated roads up to modern standards of routing, equipment and service.

(2) That a comprehensive system of passenger subways would not pay financially, or, in other words, that the present and profitable future volumes of passenger traffic would be inadequate to support a comprehensive system of subways in addition to existing means of transportation.

(3) That an independent system of municipal passenger subways, even with a large carrying capacity supplemental to existing lines, would increase, rather than diminish, traffic congestion in the downtown or Loop district.

(4) That the effect of a comprehensive system of passenger subways would be to upbuild the business facilities of the downtown or Loop district at the expense of outlying business and residential districts.

(5) That genuine rapid transit in Chicago can be obtained by making new contracts with a privately owned transportation monopoly, such contracts to include the exclusive use for operating purposes of such limited downtown subways as may be built at the city's expense, to enable the existing companies to get rid of downtown or Loop district congestion.

Each group of objections was met with counter arguments based largely on the existing transportation facilities in Chicago and a comparison between them and those in New York City. The financial problem was discussed at length. The report presented under this head consists of subject matter on fixed charges and investment with estimated cost of the subway system and the necessary yearly revenue to meet expenses, 5 per cent interest on the capital invested being allowed with 1 per cent set aside for a sinking fund. The question of traffic volume was taken up and considered in detail, each of the arguments being based on the existing traffic of surface and elevated lines.

One of the surprises of the entire report was found in the commission's views on the proposed merger of the surface and elevated lines. In dealing with this question the commission said that "while there has been no definite plan or basis outlined as to the merger of the elevated and surface lines, the general proposition, from the traction standpoint, has been to follow the 1907 ordinances. It would be impossible to have two distinct financial schemes —one for the surface lines and one for the elevated. If this plan is followed the result would be an agreed valuation for the elevated roads. To this valuation should be added the following: First, the cost of making each of the roads a four-track structure; second, the cost of additional terminals, new rolling stock, additional electric power and equipment." The pith of the whole argument against this proposed merger is found in the commission's statement that it would mean "simply turning the 55 per cent city traction fund over to the elevated roads to pay interest on a fictitious valuation." To meet the suggestion that the surface cars be allowed to use the downtown subway system the commission says that if rapid transit subways are built, surface-car subways will not be necessary because the surface cars will be relieved of the long hauls.

The Office End of a Maintenance Shop

The Value of Record Keeping and of Concentrating on the Elimination of Special Defects Is Clearly Set Forth by Instances from Practice

BY J. C. THIRLWALL, SHOP FOREMAN BROOKLYN RAPID TRANSIT SYSTEM

Many articles have been written on different features of shop practice, on specific measures of economy or efficiency in maintaining car equipments and on the management of employees, but one of the most important aids to obtaining the maximum efficiency from the shop organization I believe has been neglected, not only in discussion, but also in ordinary practice. I refer to the value of a comprehensive record system of equipment defects, kept in the shop itself and not in the general office, and employed by the foreman as a direct guide to the prevention of operating troubles and to the improvement or correction of weaknesses of construction or of defective maintenance methods.

In this connection the experience of the foremen of two large maintenance shops, each of whom independently worked out such a system of recording troubles, may prove of interest and value to others. In these two cases the impelling force which led to the adoption of local records was the same. A number of causes, in part unavoidable and in part preventable, when seen in the light of subsequent events, had brought about an excessive amount of equipment defects of all kinds. Motor, control and air-brake failures were extremely high compared to what had been the average for some time previous. Cars "run in" for equipment failures were numerous, and the number had been increasing for several months.

The foremen realized these things clearly enough, and any points they might have overlooked were being forcibly and vigorously called to their attention by the head of the department with increasing frequency and vividness. Both men were following up as closely as they could, so they felt, the individual workmen under their supervision and the work done on the cars on inspection, overhauling and repairs, but the number of cars handled per day was large, their forces were of necessity scattered over a large space, and the very multiplicity of details that required attention was so great that both felt the need of taking hold of the situation from a different angle and of obtaining a greater leverage. They hit upon the same scheme independently.

Their first step was to take the previous month's reports of control, motor and air-brake troubles and pick out each particular class of defects. For instance, motor troubles were divided under the headings of flash-overs, leads burnt off, brush holder grounded, shunts striking shell, hot armature bearings and hot axle bearings, all of these being considered defects preventable under proper maintenance conditions. Other defects, such as broken brush holders, grounded armature coils, grounded fields, wire bands broken, etc., were considered, for the time being, unavoidable, but were found to be less than one-half of the total defects.

REDUCTION OF FLASH-OVER TROUBLE

A special effort was made at once to reduce flash-overs, as this was the most frequent defect, by the thorough blowing out and painting of shells at each inspection and by the elimination of short-circuited fields or armatures. When analyzed, the month's record showed that in several instances the same motor had flashed over as many as six or eight times, although each inspector had reported "cleaned and tested out O. K." Such cars were brought into the overhauling shop immediately and the armature was replaced. In most cases the motors then gave no further immediate trouble. This fact indicated that short-circuited armature coils had been the cause of the repeated flashes, and to obviate an excessive amount of such trouble, a rule was made that after three successive flash-overs the armature should be replaced at once, whether the commutator showed evidence of short-circuit or not.

To insure against the neglect of this rule, a flash-over record was inaugurated, a separate card being assigned to each motor, and a record of each report of flash-overs, whether from the road or found on inspection, was entered under dates and under the individual motor number. A few minutes' work a day was all that was required to keep this up, and immediately after a third consecutive entry was made for any motor the car was ordered into the shop and the armature was removed, an entry also being made of this change.

This practice proved a great help in reducing the total number of flashes, and a concentration of inspection upon the proper cleaning and painting of shells, brush-holder tension, etc., quickly reduced this class of trouble to a minimum. Next, the brush holders had special attention, in particular the insulators and bolts. Liberal renewals of all burnt or cracked insulators, the regular tightening of bolts, a free use of shellac on the insulator and brush-holder body, after both were carefully cleaned, practically eliminated grounded brush holders, which had been a frequent source of trouble. What I am emphasizing is simply this: Each class of trouble was studied in the order of its frequency of occurrence, special preventive measures were applied to each, and the interest and co-operation of the individual employees were sought by an explanation of the reasons for the steps taken. To aid this latter idea, too, an individual record was commenced by posting on the shop bulletin board a daily sheet which gave a list of the motor defects reported the previous day, the trouble found in each case, the date of the last inspection and the name of the inspector who had had the car on that date. To keep their names off that list for the greatest number of days in the month speedily became a matter of pride with the inspectors, and the record became one of the most valuable aids toward securing desired results which the foreman had.

MOTOR DEFECTS

A comparison of the motor defects reported on the combined lines of the two shops mentioned during the winter of 1910-1911, as against the same months of the winter of 1911-1912, is shown in Table I, and from this table the tremendous decrease made as a result of this policy is strikingly apparent:

TABLE I.—SHOWING REDUCTION IN MOTOR DEFECTS.

	Dec., 1910.	Jan., 1911.	Feb., 1911.	Dec., 1911.	Jan., 1912.	Feb., 1912.
Flashes	117	102	61	19	20	15
Armatures, grounded, open, or short-circuited	47	42	19	26	29	23
Fields	9	2	1	2	5	2
Grounded brush holders	8	10	6	1	2	0
Brush-holder springs and shunts	18	7	2	2	1	2
Hot axle bearings	1	0	1	1	2	0
Hot armature bearings	18	16	10	6	2	1
Brush-holder leads	6	8	4	6	5	5
Field leads	8	11	9	8	6	8
Gears and pinions	15	12	13	6	5	8
Total	247	210	126	77	77	64

It will be noted that the great reduction was in flash-overs, and that this in turn reduced the number of defective armatures.

AIR-BRAKE TROUBLES

Similar results were obtained in the air-brake work. The shops referred to were handling elevated equipment, which ran almost exclusively in train service, and the investigation of the details of the air-brake troubles showed

an excessive number of defective hose and hose gaskets. This was one of the first points concentrated upon. A careful inspection of a number of burst hose revealed the fact that in almost every case such hose showed, when bent or twisted in the hands, that the outer layer of rubber would crack or check to an excessive degree. Cut or flattened gaskets also were found to occur almost entirely after the rubber had deteriorated to such a degree as to be readily apparent. Both could be prevented by a more careful inspection and more frequent renewals. Accordingly the rule was made that all hose connections must be broken as cars were brought in for inspection, the hose bent and examined for checking and the gaskets closely examined. This change quickly reduced hose troubles to a minimum and led in turn to a large reduction in many other troubles, such as grounded or open-circuited armatures or baked fields in the compressors, burnt governor contacts, short brushes, etc.—all of these defects being due primarily to the excessive running of the pumps on account of loss of air by hose leakage.

Grounded brush holders due to oil and dirt upon the insulators were another troublesome feature. This defect was eliminated in part by the substitution of fiber insulators in place of fullerboard, and in part by the regular and frequent removal of the brush holders from the pumps and the thorough cleaning and shellacking of the insulators. Other points were taken up, one by one, in a similar manner, with the results shown in Table II., for two successive months in 1910 and for the same months in 1911 and 1912:

Table II.—Showing Reduction in Air-Brake Defects.

	1910.		1911.		1912.	
	Aug.	Sept.	Aug.	Sept.	Aug.	Sept.
Defective hose	24	15	19	7	1	2
Hose gaskets	38	24	12	15	1	1
Governor adjustment	9	14	10	7	2	1
Governor contacts	13	29	0	1	1	1
Short brushes	6	3	4	1	1	0
Grounded brush holders	9	7	12	6	0	0
Motorman's valves	15	19	1	1	2	0
Feed valves	19	14	4	7	3	5
Cylinder head gaskets	19	6	6	0	3	3
Triples, pipes broken, etc., miscellaneous	30	18	16	24	12	9
Armatures	28	11	8	8	9	3
Fields	7	2	4	3	1	0
Total	217	162	96	80	36	25

CONTROLLER TROUBLES

On the controllers of the electro-pneumatic multiple-unit type the most striking defect shown, and the most serious in view of the resulting frequent detentions, was the failure of magnets to operate. To overcome this the adjustment of the air gap by means of metal gages was made at regular intervals, and all the controllers were tested at each inspection on a lower voltage than they were to operate upon in service, in order more readily to detect any magnet that might be sluggish by reason of wrong adjustment, dirt, gummed oil or bent stems. A more frequent cleaning of the needle valves and springs also was inaugurated.

OTHER ELECTRICAL TROUBLES

More attention to the condition of contacts in both the motor and battery circuits, an insistence on the regular cleaning of the interlock plates and fingers, and in particular on the careful adjustment of tension on all motor circuit contacts and fingers, reduced the troubles of this class to an almost negligible point and also helped to cut down the cost of excessive repairs due to burn-outs, which at one time had been a serious item of expense.

Table III—of control troubles in 1910, 1911 and 1912—illustrates the points referred to and others which received particular attention, and the results obtained.

VALUE OF RECORDS FOR ENCOURAGING SHOPMEN

It is not intended to imply that great reductions in many of the foregoing items could not have been made without the use of the record systems. It is simply that the records were a very direct and positive aid toward picking out those particular troubles which were susceptible of immediate improvement and enabled those in charge of the work to view the situation more intelligently and to decide on the steps necessary to secure better results. The issuance of copies of the troubles, subdivided into classifications even more in detail than is indicated above, to the individual inspectors also helped materially by keeping them fully posted on what particular parts of the equipment were giving the most failures and therefore required the closest attention. Indeed, the writer believes strongly in the policy of giving all of the shopmen as much information as possible in regard to the performance of the equipments which they are maintaining. These data should call their attention to increases or decreases in troubles as compared with the previous month, or with the previous year, and also to comparisons with the work done in other shops which handle similar equipments. There can be no question that the best results in any line of work can be obtained only through stimulating the interest and enthusiasm of the individual workmen, and there are, of course, an almost infinite number of ways of accomplishing this. This way is one, though, that the writer knows will produce good results if properly pursued.

Table III.—Showing Reduction in Controller Troubles.

	1910.		1911.		1912.	
	Aug.	Sept.	Aug.	Sept.	Aug.	Sept.
Magnets	60	44	34	23	8	9
Motor circuit fingers, tips and contacts	22	20	13	9	6	4
Battery circuit interlock fingers and contacts	23	30	29	15	11	2
Batteries	35	11	7	3	5	0
Leaky air cylinders, miscellaneous	8	12	11	10	3	2
Broken springs, leads, resistance, etc.	17	28	36	46	12	27
Total	165	145	130	106	45	44

In this connection the general office must not be forgotten. The records kept there, as a rule, are far more elaborate and comprehensive than can or should be compiled in the individual shops. These records can be used to great advantage along the same line, and they are so used by a great many of the leading companies, but unless the information so obtained is transmitted to the foremen or others in direct charge of the maintenance work it will fail of its greatest usefulness. The more closely the foreman or local superintendent can be put in touch with what is occurring on all lines of the system and with the results that other foremen or superintendents are securing, the more intelligently he can handle his own part of the work.

This idea has been broadly developed on one road. Each shop foreman receives monthly a tabulated summary of the equipment defects reported against every other shop on the system, a list of the cars "run in" on every line and a book of curve sheets which show data as to costs, troubles and detentions. These curves are subdivided under the various parts of the equipment, such as total motor troubles, defective armatures, motor leads, etc., and a glance at each curve shows the performance of the road as a whole or of individual divisions, in so far as the mechanical department is concerned, and the relation which that performance bears to that of any previous time since the record was commenced some five years ago. As the data referred to are given in terms of car miles run, they constitute a very valuable index to the efficiency of maintenance of every part of the equipment and to the respective efficiency of different shops. The plan has certainly wakened a spirit of competition and a desire among the heads of individual shops to "bring the curves down." The curves, not only of troubles, mechanical and electrical, but also of costs of labor and material, have come down, and to a remarkable extent, in the past few years.

As an example, with a constantly increasing mileage, the total defects of all kinds reported on cars in service on one division of the elevated lines, handled by one shop, which

maintains approximately 350 cars, dropped during the past few years as shown in Table IV.

TABLE IV.—SHOWING REDUCTION IN NUMBER OF DEFECTS.

	1910.	1911.	Nine Months. 1912.
Total defects reported	11,255	5,903	2,320
Average per month	938	492	258
Average decrease each year, per cent	....	50	50

When such results as the figures shown in this table have been actually obtained, all of the factors which contributed toward so satisfactory a record may well be thoroughly considered by other roads. It is felt by all concerned on the road in question that its system of records has been a valuable means to the end of obtaining high efficiency and one with which the road could not well dispense.

MODIFICATION OF NEW YORK TRANSFER ORDER

A rehearing was begun before the Public Service Commission of the First District of New York on Oct. 25, 1912, upon a petition of the New York Railways Company in respect to the order of the commission made in the proceeding under the date of Dec. 5, 1911, which required certain transfers to be made between local street railways in the borough of Manhattan. All of the commissioners were present. James L. Quackenbush and Frank Hedley represented the New York Railways; Chase Mellen the Central Park, North & East River Railroad; Edward A. Maher the Third Avenue Railway; Brainard Tolles and George W. Lynch the Second Avenue Railroad.

Mr. Quackenbush referred to the communication addressed previously to the commission in regard to the arrangements made between the companies to restore certain transfers in accordance with the details contained in the statement to the commission. He said that the several companies interested were prepared to carry out an order of the general character set forth in the petition of the New York Railways for a rehearing and explained that the transfer privileges now enjoyed by the public would still be continued if the commission accepted the new proposal. Mr. Quackenbush also explained why certain transfers sought to be established could not be put into effect. At the suggestion of Chairman Wilcox of the commission the hearing was adjourned until Oct. 29, with the understanding that Mr. Quackenbush would confer with the members of the commission on Oct. 28.

There was a very short session of the commission in the matter on Oct. 29, following which the commission issued an order modifying the order of Dec. 5, 1911, calling for the restoration of free transfers at 151 points in the borough of Manhattan. The order, as modified and passed on Oct. 29, provides for the establishment of a system of free transfers in accordance with the plan recently proposed by the New York Railways, which has been amplified at the request of the commission to include transfers to the Sixth Avenue line as well as to other north and south lines. The new order is to take effect only when the New York Railways, the Central Park, North & East River Railroad, the Third Avenue Railway, the Forty-second Street, Manhattanville & St. Nicholas Avenue Railway and the Second Avenue Railroad all notify the commission that the terms of the order have been accepted and will be obeyed.

The order is directed to the companies named and requires them to put the new transfer arrangement into effect by Dec. 1, and within thirty days thereafter to make an agreement as to the portion each company will receive of the 5-cent fare. By Jan. 10, 1913, they must notify the commission whether such agreements have been entered into and what the terms are. Nothing in the new order is to be construed as in any way authorizing the abandonment of any free transfers now given or an increase in any fare now charged. The original order of the commission made on Aug. 2, 1910, for transfers between the Metropolitan Street Railway, the predecessor of the New York Railways, and the Central Park, North & East River Railroad has been abrogated.

It is expected that as a result of the agreement embodied in the order just issued the companies will discontinue the court action begun against the commission in resisting the original order. Pending the acceptance of the order the commission has adjourned the hearing until Nov. 7.

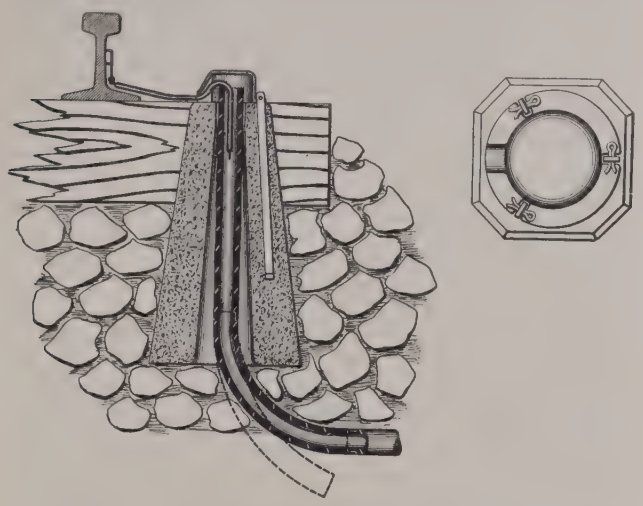
The transfer arrangement as provided in the new order makes the Central Park, North & East River Railroad, which operates across town through Fifty-ninth Street, the vehicle by which passengers on the longitudinal lines of the New York Railways, the Third Avenue Railway, the Second Avenue Railroad and the Forty-second Street, Manhattanville & St. Nicholas Avenue Railway can begin their journey on the East or West Side of the city at the north or south end, transfer and cross the city via the Central Park, North & East River Railroad and retransfer and continue their journey in the original direction on the line of the company to which they originally paid their fare and in some instances on a line of one of the other companies, thus in some cases involving three roads in a joint fare. Where the original fare is paid by a passenger to the Central Park, North & East River Railroad the passenger will, with a few exceptions, have the privilege of transferring and continuing his journey either north or south on the connecting longitudinal lines. Restrictions have been imposed to prevent passengers on the longitudinal lines from transferring across Fifty-ninth Street and continuing their journey on a line which closely parallels the one to which they paid their fare as from Madison Avenue to Lexington Avenue or from the Seventh to the Eighth or Ninth Avenue cars. Passengers who pay their fare to the Third Avenue Railway will be permitted to cross the city and continue their journey either on the Broadway or the Tenth Avenue cars of the same system, but not on a car of the New York Railways. Passengers on one of the First or Second Avenue cars of the Second Avenue Railroad will, however, have the privilege of transferring across town via Fifty-ninth Street to the Third Avenue Railway's Broadway cars or the New York Railways' Eighth Avenue cars.

EXPERIMENTS WITH KEROSENE FUEL

What promises to be an investigation of more than usual interest and utility is being conducted by the Engineering Experiment Station at the Pennsylvania State College under the direction of Prof. J. A. Moyer, of the mechanical engineering department. With the increase in the price of gasoline has come the demand for some cheaper fuel that will give as good results. Kerosene would meet the demands if a satisfactory carburetor can be designed, and it is with a view of determining the merits and defects of various types of carburetors that the investigation is being carried on. The price of gasoline has nearly doubled in this country in the past year, while in England the price has risen to 50 cents a gallon for "motor spirit." Many of the writers in the trade journals in England advocate the use of a mixture of gasoline and kerosene, but point out that without an efficient carburetor no such mixture may be used. Professor Moyer, who has made numerous experiments on smoke washing and electrostatic treatment of smoke, has already installed at the college a motor built to utilize the energy from either of the two fuels mentioned which is suitable for use on farms and country estates. Experiments will also be made on various mixtures, and a carburetor valve will be designed to shift the fuel supply automatically from a small gasoline tank, used only for starting, to the main kerosene tank. These experiments should be of interest to manufacturers and users of gasoline motors throughout the country.

A NEW OUTLET CASING FOR UNDERGROUND CONNECTIONS IN TRACK CIRCUIT SIGNAL SYSTEMS

Since the introduction of fiber conduit as a means of protecting underground wires for railway signal installations there has been a growing need of some means of protecting this conduit at the outlets exposed above ground where connections are made to the rail. One way of doing this is to fasten an iron plate across the ends of the ties and have a hole punched through it large enough to admit the conduit, which projects about 2 in. above the plate and is provided with a cap. This is merely a support and does not protect the conduit between the ties where tamping is done, leaving it exposed to the point of the section man's pick. Any movement of the ties due to creeping of rails is liable to put a strain on the conduit, and the end is exposed to objects hanging from the train. Iron pipe-bends used for this purpose are not so durable as fiber conduit and are not permissible with a.c. track circuits on account of the inductive reaction of the iron.



Cross-Section of Removable Boot Leg and Plan View of Cast-Iron Cap

A more substantial, though more expensive, way to protect these outlets is by the use of reinforced concrete built around the conduit and having a wood plug formed into a cap inserted in the opening with a groove in it through which the wire is led out. This presents a very neat appearance. It is, however, so substantial that when it becomes necessary to make track changes involving changes in the location of the conduit the latter has to be destroyed and rebuilt, and when the conduit is not entirely protected by concrete there is a possibility of the frost influences causing a fracture of the conduit where it enters the concrete.

In order to overcome the objections to the last-mentioned type of outlet, a detachable boot leg, as shown in the accompanying illustration, has been developed. It consists of a concrete envelope made by the same process as concrete building blocks having a bore of larger diameter than the conduit so that it can be slipped over or removed from the conduit with a minimum of labor.

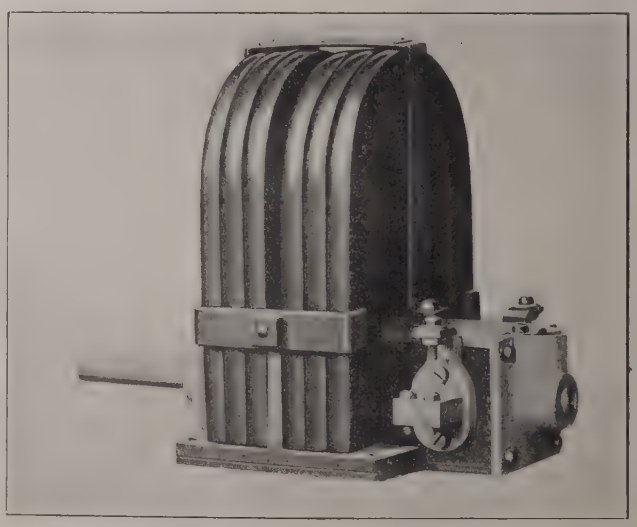
The core is widened toward the lower end so that any displacement of the boot leg will not bring a strain on the conduit. A cast-iron cap which is entirely supported by the concrete envelope is provided and is held in place by cotter pins in three iron studs set 120 deg. apart and extending through the flange of the cap. These studs extend into the body of the boot leg and act as reinforcing rods for the concrete casing. The conduit is led up inside of the cap and the track wires are turned over and led out through an opening in its side. This construction prevents water from entering the conduit, and in fact if it is covered with melting snow the water will drain off through the space between the conduit and the concrete casing, thus keeping the interior dry.

The boot legs described are made to suit the various sizes of fiber conduit, and the caps are made to suit the different sizes of wires and cables, by the manufacturers, the Signal Accessories Company, New York. The device is the invention of M. H. Loughridge, assistant engineer New York, Westchester & Boston Railroad, and, although only recently introduced on the market, its advantages are so obvious that there are now approximately 1200 in service.

AN ELECTRIC SPEED INDICATOR

An electric speed indicator consisting of a magneto-generator and a direct-current measuring instrument has recently been brought out by the Holtzer-Cabot Electric Company and the Westinghouse Electric & Manufacturing Company. The magneto is attached to the pulley or shaft whose speed is to be measured, and since the voltage of the magneto-generator is proportional to its speed a properly calibrated meter indicates the speed directly at any time. When operating at 1000 r.p.m. the magneto generates 25 volts, so that the meter may be calibrated for any unit, such as revolutions per minute, cycles per second, percentage fast or slow, or feet per minute.

On account of the ease with which these indicators may be adapted to the many types of machiiery, they find a wide field of application. A comparatively new use is for determining the speed of trains or electric cars. The indicator may be attached to the axle and, if the meter is adjusted to prevent jar, this will give excellent results. A complete record may be made by the use of a graphic meter in connection with the magneto. This use will prove especially beneficial where a test of efficiency of a piece of apparatus is desired.



Electric Speed Indicator and Recorder

The indicator is small, the over-all dimensions being only 6 in. x 10 in. x 10 in., and a variety of meters may be used with it.

In the discussion on the specifications for cold-rolled axles at the meeting of the Engineering Association on Oct. 11 as reported in the issue of this paper for Oct. 12, page 842, C. V. Slocum, of the Titanium Alloy Manufacturing Company, was quoted as saying that he was satisfied with the revisions shown in the supplementary report of the committee. The speaker was Frank S. Slocum, special representative of the Jones & Loughlin Steel Company, Pittsburgh, Pa.

A STORAGE BATTERY CAR OF RECORD SIZE

During the past week there have been conducted trials of a new storage battery car of unusual proportions, as its over-all length of approximately 50 ft. establishes a record for single-body storage battery cars. It is to be placed in the service of handling local passenger and express traffic on a branch of the Chicago Great Western Railway which has been heretofore operated by steam locomotives. On account of the requirements of the service for which the car is intended the body has been divided into three compartments, of which one is for baggage and express, another for smokers, and the third, or largest, is arranged like a standard passenger coach.

This car, which was built by the Federal Storage Battery Car Company, is 49 ft. 8½ in. long over drawbar, 9 ft. 1 in. wide over drip rail and 12 ft. 6 in. from rail to top of ventilators. It is equipped with 220 type A8H Edison nickel-steel alkaline batteries for power and ten type A8H cells for light. These batteries are placed under the car in two compartments, strongly reinforced with structural shapes and riveted to the underframe. The batteries are of the special railway type, having 3 in. of water over the plates. The car is equipped with four 20-hp, 75-amp, 200-volt, 720-r.p.m. series-wound motors. Two of these are placed on each truck, one on each axle, and one wheel on each axle is driven by a gear fastened to the inside of the wheel hub, the ratio of reduction being 3.5:1. There are two series-parallel controllers, one on each end of the car, with four series and three parallel positions. All power wires are carried in conduit securely fastened to the underframe. The car is equipped with M.C.B. couplers of standard height of drawbar, locomotive type of pilots on each end, a locomotive bell and an electric horn. The equipment includes a straight-air system of air brakes with a compressor which automatically cuts in when pressure drops to 45 lb. and cuts out when the pressure reaches 60 lb. Hand brakes at each end of the car are also furnished.

The underframe is made up entirely of structural shapes, riveted together and strengthened with truss rods on each side. The interior finish is of ash and polished bronze in the passenger compartment, which is 22 ft. long. This has ten cross reversible seats, seating two passengers each, two stationary cross seats for two passengers each, and two longitudinal seats with space for one and three passengers respectively. The seats are covered with woven rattan and have the usual bronze grab-handles. In this compartment is a toilet room with a dry closet and a water cooler. The smoking compartment is 5 ft. 3 in. long and has four stationary cross seats for two passengers each, the total seating capacity of the car being thirty-six passengers. The baggage and express compartment is 15 ft. 6 in. long, with sliding doors on each side. A hot-water heater is placed in it, and from the heater pipes run through the other compartments.

The trucks are of diamond-frame type and while of light construction are exceptionally strong. The wheels are chilled iron and, in accordance with the company's standard design, they are free to rotate independently of each other on the stationary axles. This is accomplished by pressing on to each axle a nickel-steel hardened sleeve over which two trains of rollers rotate. The rollers, which are of the Rollway type, in turn are held in a nickel-steel hardened raceway pressed into the wide hub of the wheel.

In all of its trial runs the car has shown very satisfactory running qualities. Most of its trips have been made between Jersey City and Silver Lake, N. J., a round trip distance of 20 miles. A maximum speed of 35.6 m.p.h. on level track and 29.6 m.p.h. on a 2 per cent grade has been attained with an energy consumption reported to be 30.4 watt hours per ton mile in the former case and 46.3 watt hours per ton mile in the latter. The car, including the battery, weighs 29.5 tons, and its train resistance per ton was stated to be 15.2 lb. per ton and 24.7 lb. per ton respectively for the level and for the 2 per cent. grade. While the radius of action of the car on the rated capacity of the batteries is 79 miles, the actual radius has been found to be 89 miles and on an overcharge the maximum output of the batteries will permit the car to be operated for 100 miles. On the round trip between Silver Lake and Jersey City, including grades both ways, the car was found to consume about 5.65 amp.-hr. per car mile at a voltage between 238 and 225, the air compressor requiring 0.10 amp.-hr. per car mile in addition.

Combination Car Operated by Storage Batteries in Branch Line Service

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Two horse-drawn emergency wagons have been replaced with one large truck of the most approved design by the Nashville Railway & Light Company, Nashville, Tenn. The company has purchased a General Motors Company car, with a specially-designed tower body, from the Woolwine Commercial Truck Company. The truck is capable of 18 m.p.h.

LONDON LETTER

(From Our Regular Correspondent.)

The question of the assessment of tramway systems for rating purposes has been discussed at recent meetings of the Glasgow Town Council. For the last four years the Glasgow municipal tramway system has been assessed on the full valuation of the lines. The sub-committee on finance of the Council proposed that an appeal should be made with a view to having the tramway assessed on one-fourth of the valuation, especially as the King's Bench division of the English courts decided recently that a tramway and light railway should be assessed on that basis. After discussion, however, the proposal to appeal was defeated. Manchester is also interested in this problem, but it seems to be difficult to secure such an assessment as was proposed because it is maintained by some that tramways are different from railways.

The directors of the Lancashire & Yorkshire Railway have arranged to electrify a further section of the line from Liverpool, between Town Green and Ormskirk. The station at Ormskirk will be altered and it is proposed to reconstruct Aughton Park Halt, which lies between Ormskirk and Town Green. The company has invited tenders for a substation at Ormskirk on the east side of the present railway station, to be used in connection with the generating station at Formby. The system which has been adopted was installed by Dick, Kerr & Company. Power is generated at Forby at 7500 volts three-phase, and is delivered by underground cables to the substations, where it is converted to direct current at 620-630 volts, for use at the third rail. The company is installing the third set of conductors on the eastern lines between the Exchange Station, Liverpool, and Sandhills.

The general plans for the electrification of the Thames Valley lines of the London & South Western Railway have been prepared by Jacomb-Hood, the chief engineer, but no decision has yet been made as to whether the overhead single-phase alternating-current or the third-rail direct-current system will be adopted. The board is awaiting the return from the United States of Mr. Jones, the company's electrical engineer. Unless something unforeseen occurs the choice of a system will probably be made in about a month.

The Municipal Tramways Association held its eleventh annual conference at West Ham during September. H. E. Blain, the manager of the West Ham Corporation Tramways, occupied the chair as this year's president. After the presidential address had been delivered a paper, "Tramway Administration by Municipalities: a Retrospect and a Forecast," was read by Councillor Neumann of Bradford. After luncheon the interim report of the committee on corrugation was discussed. On the morning of the second day a paper, "Tramway Fares and Their Basis," was read by W. J. McCombe, tramways manager of Hull. After luncheon, special cars were provided to convey the delegates to the exhibit of tramway appliances installed at the tramway depot. The association dinner was held in the evening of the second day. The subject of motor omnibus competition seemed to obsess nearly all the members of the congress, especially those connected with enterprises in or near London. At the annual dinner the subject was again referred to, and the opinion seemed to be that it was the duty of the association to meet the organized competition of the motor buses.

Columns are still being printed in the daily press in regard to the advantages of the motor omnibuses as compared with the London County Council tramways. Omnibuses have always had a prominent place in the transportation problem of London, and with the advent of what may almost be termed the perfect motor omnibus and the taking over of the principal omnibus companies by the Underground Electric Railways of London, the competition has become keener than ever. Some idea of the problem may be arrived at from a statement of the number of passengers carried by the various methods of transportation. For a period of six months, the London County Council Tramways are stated to carry 267,000,000 passengers; the Metropolitan Electric Tramway, 45,000,000; the London United Tramways, 31,000,000; West Ham, 20,000,000; East Ham, 18,000,000; the London Electric tubes, 51,000,000; Metropolitan (underground), 50,000,000; District Railway (underground), 43,000,000; Central London tube, 17,000,000; City & South London, 12,000,000; Great Northern & City, 7,000,000; East London, 2,000,000; London General Omnibus Company, 224,000,000; National Steam Car (which is practically the only other omnibus company competing), about 7,500,000. This works out to a grand total of nearly 800,000,000 for the six months. Tramway experts believe, as a result of recent investigations, that a solution will be found in linking the various tramway systems of London. Through-running would be also necessary from the central terminals to the farthest suburbs, at reduced fares.

In order to meet the motor omnibus competition, West Ham has already reduced its fares, with good results. At the meeting of the Municipal Tramways Association previously referred to A. L. C. Fell, manager of the London Country Council Tramways, advocated a closer union between tramway authorities to secure better running arrangements. He maintained that if this were done there would be nothing to fear from competition. Mr. Fell stated that while the struggle might go on for some little time there was no prospect of the motor omnibus ousting the tramways. The chief complaint of those interested in tramways is that the motor omnibus companies pay nothing toward the up-keep of the roads, and although they have to pay a considerable petrol tax which goes to the Road Board, much of that money is spent outside of London. There is no doubt that many of the outside local authorities through whose streets motor omnibuses are run have to meet larger expenditures in the up-keep of the roads. Macadam especially yields to the heavy traffic of the fast-traveling motor buses. In the meantime, the London County Council finds it increasingly difficult to secure rights to extend the tramway system. Many of the authorities will not act in conjunction with it or consent to bear a portion of any street widenings that may be necessary. With the success of the motor omnibus, the local authorities seem to think that it is unnecessary to expend any more money in widening streets, which has to be done where tramways are constructed. It is pointed out, for instance, that the London County Council is to contribute the sum of £20,000 to the widening of St. Paul's Churchyard, as an approach to the new St. Paul's Bridge, although the tramway undertaking is already pledged to spend £86,000 on an underground subway which will convey the trams along the northern approach to a terminus below the street level in St. Paul's Churchyard. When the widening has been completed, it is claimed that the motor omnibus will have the right to use the street without paying for the privilege.

In the meantime, the London County Council has applied to the Board of Trade to sanction experiments with a new system of propulsion for the cars on the tramway system between Free Ferry, Woolwich and to Abbey Wood. The cars are to be propelled with current from a generator on the car driven by an internal combustion engine.

A keen discussion has been in progress in Birmingham in regard to the relative merits of tramways and motor omnibuses. Early in the year the City Council instructed the tramways committee to proceed with the construction of a tramway along the Hagley Road, but subsequently a resolution was carried authorizing the tramways committee to report on the advisability of obtaining parliamentary powers to operate motor omnibuses and to defer the construction of the tramway. Information obtained by the committee in regard to the relative costs of operating and maintaining the two systems shows that the cost of working the tramways in Birmingham is 6.906d. a mile, while that for the motor omnibuses would be 8d. a mile. The committee also considered reports from other corporations which have experimented with motor omnibuses. The conclusion of the committee is that from the point of view of economy and trustworthiness the omnibuses do not at present compare favorably with electric tramways. The committee unanimously considers that the Council should authorize the construction of all the tramways referred to in the new act, including the Hagley Road lines and the new tramway depot at a cost of £30,000. The committee also considered the question of the railless trolley system for Harborne, but decided that the trackless system could not cope with the traffic.

A. C. S.

News of Electric Railways

Drafts of Detroit Rental Suit Decrees Presented

The terms of the decree which is to be rendered in the Fort Street rental case at Detroit were discussed before Justice McAlvay of the Supreme Court of Michigan at Lansing on Oct. 21, 1912, by Attorneys Hinton E. Spalding and W. L. Carpenter for the Detroit United Railway and Corporation Counsel Richard Lawson and Alfred J. Lucking for the city of Detroit. Both sides presented copies of decrees prepared for the consideration of the court.

Corporation Counsel Lawson said that in the draft of the decree prepared by the city attorneys an endeavor had been made to follow the terms of the opinion rendered by the court some time ago, and that an effort had been made so to define the company's rights that it would not be necessary to go to the Supreme Court again. The city desired that the case be remanded to the Wayne County Circuit Court so that it would not be necessary to go back to the higher court. He asked the court to consider the company in the light of a new organization seeking a franchise. He argued that plenty of time was given in which to negotiate, although under the draft prepared by Attorneys Lawson and Lucking the company must ask permission of the Common Council within ten days to operate on the streets in question, and unless such permission is secured the company must remove its tracks in twenty days.

Mr. Spalding, for the company, contended that the time when the company shall cease operations in the street should be fixed by the Common Council and not by the court. He agreed with the provision in the city's draft that the rights of the company in the street are ended, but he argued that the time allowed for the removal of the tracks was unreasonably short. He reviewed the difficulties that would follow should the operation of the Fort Street line be discontinued. The car shops on Monroe Street and the car shed at Clark Avenue were both reached over this line. While 16 miles of the line were affected by the decision, 10 miles were still in the hands of the company. The shops were located on the part affected. According to an affidavit made by General Manager Brooks, the company has 200 miles of track in the city and between 1100 and 1200 cars. Most of the repairing was done at the Monroe Street shops. The only other outlet to the shops was a single track on Monroe Street. If the Fort Street line was torn up, the whole system would be compelled to cease operation, because the repair shops could not be reached, and there were no other shops to take their place.

In discussing the provisions of the city's draft requiring the replacement of the pavement, Mr. Spalding said that all of the track affected was in the paved district, and that out of the 16 miles, 10 miles were of brick. The company's engineers had estimated that 161 days would be required to remove the track, without allowing time for the replacement of the pavement. It would cost $75,000 to relay the pavement, and if this work was done during cold weather it would cost even more, and there would be no assurance of good work. He asked the court to fix a minimum time within which Council could order the removal of the track and to consider carefully the question of a reasonable time in which to conclude negotiations. He said that there was no prayer in the city's petition asking that the pavement be relaid and that the records of the case did not furnish any evidence on that point.

Mr. Carpenter said that the Common Council should be left to deal with the question as it saw fit. He also said that in passing the resolution authorizing the beginning of the suit the Council did not intend that the operation of the Fort Street line should be discontinued. This was evidenced by the defeat of a resolution to that effect.

Attorney Lucking, for the city, said that nothing beneath the surface of the street but the ties belongs to the company. He asked that the court forbid any argument on that point. He said that the contention of the company that it would cost many times as much to take the ties up as it did to put them down had been greatly exaggerated.

The Highland Park Railway attempted recently to build a line across Hamilton Boulevard in Highland Park, a suburb of Detroit, but the village authorities, headed by President John Austin, compelled the workmen to stop. They then started to tear up the track, but were stopped by an injunction. The workmen continued the track laying. The village authorities claim that the Highland Park Railway is a part of the Detroit United Railway and that an attempt is being made to build the line without securing a franchise.

Strike in Columbia, S. C.

The employees of the Columbia Railway, Gas & Electric Company, Columbia, S. C., went on strike on Oct. 19, 1912, following a series of conferences between the officers and representatives of the men which had progressed so far and so satisfactorily that the officers of the company had been assured by a committee of the representatives of the men that they would recommend for adoption terms between the company and the men tentatively agreed to by the committee.

At 6 p. m. on Oct. 18 a committee of five motormen and conductors met the vice-president and Alfred Wallace, the superintendent of the company, and at the conclusion of the meeting it was agreed by the committee and the officers representing the company that an agreement in writing, duly discussed and agreed upon by the officers of the company and the committee, would be recommended by the committee to the association. The terms in which the contracting parties were described in the proposed agreement were those submitted to the company by the committee of employees on the morning of Oct. 18 and were written in the same handwriting as were all the other communications sent to the company by the association.

The next information received from the committee was given to Mr. Wallace at 2:30 a. m. on Oct. 19, and was that the association would not accept the proposed agreement. The officers of the company were under the impression that a definite and satisfactory arrangement with its employees had been settled upon, and the notice of the refusal of the association to accept this proposed agreement, and the action of the men in declaring a strike, came as a distinct surprise to them. The language describing the contracting parties to the agreement, submitted by the committee and accepted by the company, is as follows:

"Memorandum of agreement entered into this ——— day of ——— 19—— by and between the Columbia Railway, Gas & Electric Company, party of the first part, and the local association of employees of said Columbia Railway, Gas & Electric Company, by A. A. Gerald, president, located at Columbia, South Carolina, party of the second part."

The company did everything which it reasonably could to avoid any differences. It agreed upon an increase of 2 cents per hour in the pay of all motormen and conductors and agreed to enter into a liberal contract with the men as a local association, the form of such contract having been consented to by the committee representing the employees after several conferences and full discussion between the committee and the officers of the company.

When the first communication was sent to the company by the association, the company proposed that the entire matter should be postponed until the first week in November, and agreed that it would discharge no motormen or conductors during the interim without submitting the case of such discharge to the three officers of the association, agreeing to abide by their verdict. This proposition was made in order to avoid possible disorganization during fair week.

This proposal was declined and the officers of the company immediately entered into negotiations with the association through its committee of five members with the result that the form of contract was approved and the description of the contracting parties finally decided upon and embodied in the contract as submitted to the officers of the company by the committee of the association on the morning of Oct. 18. The contract was to run from Jan. 1, 1913, until Jan. 1, 1915, and provided for the follow-

ing scale of wages: Extra men, 15½ cents an hour; first year of regular service, 19 cents an hour; over one year and under eighteen months, 20 cents an hour; over eighteen months and under two years, 21 cents an hour; two years and over, 22 cents an hour.

The strikers issued the following statement through A. A. Gerald in regard to the cause of the strike:

"We contended for recognition of the Amalgamated Association and the company refused it. The company offered to recognize the local organization of street car men, but to accept this without recognition of the Amalgamated Association would have been to forfeit our charter in the Amalgamated Association. Therefore, we have struck. The strike is now on."

The company has maintained a partial service since the strike with the employees who remained faithful to the company. No serious acts of disorder have been reported.

Grade Crossing Elimination in Greater New York

The Public Service Commission for the First District has just sent to the State Comptroller at Albany a request for an appropriation for 1913 of $1,500,000 to be used in the elimination of grade crossings on the railroads within the limits of Greater New York. Under the law the cost for such elimination is borne one-half by the railroad, one-quarter by the city and one-quarter by the State, but no proceedings can be taken by the Public Service Commission toward elimination until the State shall have appropriated its quota.

Elimination work to cost about $2,000,000 is under way at Flushing on the Long Island Railroad. This was made possible by an appropriation by the State of $500,000 in response to requests made by the commission in 1909 and 1910. Additional elimination work to cost $1,400,000 would now be in progress had it not been for the veto by Governor Dix of the appropriation of $350,000 made by the last Legislature. If the $1,500,000 asked by the commission for next year is granted it will enable the commission to order elimination work to cost $6,000,000.

The total number of crossings, both public and private, within the city is 488, of which 205 are in Queens, 117 in Richmond, 103 in Manhattan, fifty-eight in Brooklyn and five in the Bronx. With the elimination work already ordered by the commission and that going on as a result of agreements between the city and railroad companies, this total will be reduced by forty-eight, of which thirty-two are in Queens, ten in Brooklyn, four in the Bronx and two in Richmond.

Mr. Whitridge Replies by Letter to the Union

In reply to a letter from Charles Lang, chairman, and J. E. Schimler, secretary, of the joint conference board of Divisions 490 and 498 of the Amalgamated Association of Street & Electric Railway Employees of America, F. W. Whitridge, president of the Yonkers (N. Y.) Railroad and the Westchester Electric Railway, said in part:

"On Oct. 24, 1912, I received from you a long letter purporting to be on the behalf of 379 employees of the Yonkers and Westchester railways, arguing that Divisions 490 and 498 of the Amalgamated Association of Street & Electric Railway Employees of America were much better and conferred greater benefits upon their members than the Third Avenue Benefit Association.

"As far as the association is concerned it speaks for itself. It would cost the men one-half of the amount paid by them to Divisions 490 and 498, and I believe that your wives and children would say the benefits derived from it were much greater than those conferred by those divisions. I do not, however, urge anybody to join the Third Avenue association, and I would never undertake to compel any, much less every, employee to join it, which is what you have demanded I shall do with your Divisions 490 and 498. The invitation to the Yonkers and Westchester men was for their own benefit; they can take it or leave it without prejudicing themselves in any way.

"I am frank to say to you that, so far as I have gone in looking into Divisions 490 and 498 of the Amalgamated Association of Street & Electric Railway Employees of America, I am afraid there is a good deal of humbug about it. If that is an erroneous impression it is easy for you to remove it, and if you do so I shall be the first to apologize to you for my unjust suspicions. I am also bound to say that if I find my suspicions are justified I shall be inclined to think that it is my duty to exert the same power to compel my employees to leave those divisions which you have asked me to exert to compel all my present and future employees to join them.

"Finally, I want to say to you that for the last two years I have been constantly hearing rumors and mutterings about a proposed strike in Yonkers. It is apparent to me that such agitation is brought about by external pressure on Divisions 490 and 498 of the Amalgamated Association of Street & Electric Railway Employees of America. The effect of all this is to make discipline lax and to make the employees discontented and disloyal to the company. This cannot go on, and I shall be much obliged, if you do not intend to strike, if you would stop talking about it. How a strike on the naked question of compelling me to make a one-sided and tyrannical contract with your unincorporated and irresponsible union is likely to strike the public you may judge from a letter I received a few days ago."

Mr. Whitridge included a copy of this letter with his reply.

Progress in Solving Operating Problems in Buffalo

E. G. Connette, vice-president of the International Railway, Buffalo, N. Y., made an extemporaneous address on street railway operating conditions in Buffalo before the Buffalo Association of Credit Men at the meeting of the association at the Lafayette Hotel, Buffalo, on Oct. 17, 1912. He said that the most important question to be solved was that of car routing. After car routes had once been established in a city they more or less fixed the lines of growth and development in that city. The question to be considered, then, was how to remove the objectionable features in the established car routes without disturbing the lines of business development. To relieve the congestion on Main Street and give a more rapid movement to the lines which operate on Main Street, the company contemplated connecting the Hoyt and Seneca Street lines. This would make one line with the cars operating from the West Side through Franklin Street to Seneca Street and through Seneca across Main Street to the end of the line. He further showed that under this plan the Elmwood cars would be operated through Franklin and Seneca Streets to the Exchange Street depots instead of through Niagara and Main as at present, thus relieving lower Main Street of both the Seneca cars and Elmwood cars. Mr. Connette believed it important that the Elmwood cars should continue to go to the railroad stations because almost all the West Side lines connected with that line. The company, however, was now furnishing about five seats for every passenger carried to the railroad stations.

Mr. Connette said that the company would not at present attempt to put into effect the plan of Mr. Barnes, of the public service commission, to bring the Elmwood and Broadway lines together. While the 5 per cent of passengers who now have to walk to transfer on the Elmwood line would be accommodated, 16 per cent would be discommoded, as they would have to transfer to reach lower Main Street. Another objection was the fact that the rush hours on the Broadway and Elmwood lines occurred at different times.

The company purposes to connect the Michigan line with the Forest line and the Fillmore line with the Hertel line and run through cars from the eastern section of the city direct to the Black Rock section. It was planned to bring the Clinton, Broadway and Sycamore cars down Washington Street to Swan, across Main to Erie, making a loop and returning along Erie to South Division and crossing Main and thence over Washington. This would eliminate the walking that the East Side passengers who transfer now have to do.

The work of the timetable department of the company was described in detail by Mr. Connette.

Referring to the increase in the rolling-stock equipment of the company, Mr. Connette said:

"The company has added 153 cars to its equipment, another 100 have been ordered and will be delivered and put

in service before the first of the year and a contract for another 100, to be delivered early next spring, has been made. This will provide the company with a car equipment more than ample to care for every possible condition."

Development Prospects in Augusta

J. H. Pardee, vice-president of the Augusta-Aiken Railway & Electric Corporation, Augusta, Ga., who was a party to the negotiations which resulted in the settlement of the differences between the company and its employees, issued a statement in regard to the prospects of the company, in part as follows, before leaving Augusta on Oct. 22, 1912, to return to New York:

"This company has in Augusta approximately 30 miles of track which is in fine physical condition. In order to accomplish this, the company has in the past eighteen months rebuilt approximately one-third of its entire trackage and brought the remainder of the track up to a very high standard.

"The railway overhead lines, including poles, trolley wires and feed wires, have been to a large extent, and wherever necessary, replaced and supplemented. Iron poles are being installed on Jackson Street and the track is being relocated at the Barrett Plaza. In the past eighteen months old cars and cars that were too small for service have been scrapped and new cars purchased. All cars have been thoroughly overhauled and new motor equipments and trucks have been purchased and installed.

"As the public well knows, a new 4000-hp steam plant has been constructed and put in operation. Electric lines distributing electricity throughout the city have been almost entirely rebuilt and reconstructed with new poles. An underground system has been constructed for service to the central and business portion of the city, although this company did not approve of the installation of an underground system, the principal reason being the liability of excess heat and floods and because the business portion of the city could have been more reliably served by the overhead system.

"The wages of practically every employee have been increased 10 per cent to 50 per cent since J. G. White & Company took over the property. This company in the last eighteen months has expended on the street railway and electric systems in this city more than $600,000.

"This company stands ready to continue to make all expenditures necessary to keep the service up to the highest standard. At the same time it invites its consumers and customers to report promptly any deficiencies that may be thought to exist in the lighting and railway departments.

"The company has well under way the development of the Stevens Creek water power, which will involve the expenditure of more than $3,000,000. But the company cannot do all this alone; it must have the support and co-operation of the business interests of the city, and with such support and co-operation we wish to see in the very near future the 'Greater Augusta' which the commercial bodies and progressive citizens have been striving to attain.

"Augusta has so many advantages on account of its geographical location, railway and water facilities that it should and will become a great city if proper co-operation is extended and maintained between its citizens and its various commercial interests."

Complicated Tax Case Against Ohio Road

Judge Cushing, of the Hamilton County Common Pleas Court, rendered a decision on Oct. 16, 1912, in the case of the county auditor against the Cincinnati, Newport & Covington Railway, in which he holds that the auditor had a right to place the company on the tax duplicate on Dec. 31, 1910, to recover about $530,000 taxes claimed to have been omitted for the years 1905 to 1910, inclusive. The decision also dissolves a temporary injunction which has prevented the collection of the taxes.

A restraining order was granted when the case was filed, this being requested by the company's attorneys in order to postpone the entry of the taxes on the duplicate until the following Monday, when a new law went into effect to prevent counties from going back six years for the collection of taxes. A motion to set aside the temporary injunction, however, was granted a few moments before the noon hour on Saturday, but it was not signed until a few minutes after that time. The county auditor, anticipating that the restraining order would be dissolved, ordered the taxes entered some minutes before. Attorneys for the company argued that Saturday afternoon is a holiday; that the order had not been signed in time to make it binding; that the auditor had violated the injunction by making the entry of the taxes before it was set aside, and that the taxes had been ordered placed upon the books by the prosecuting attorney and not the auditor. The court held that all these contentions fail and that the auditor ordered the taxes placed on the duplicate. The court held that, as the restraining order had been set aside, the court considering that it had been wrongfully issued, the auditor committed no crime in ordering the taxes placed on the duplicate and that his order is valid. It was also decided that the authority of ordering the taxes placed on the duplicate was with the auditor in this case and not with the State Tax Commission, as it was his duty to look after the taxes prior to the time when the commission took up its duties on July 1, 1910.

The court did not enter a judgment for the amount claimed, as the case is to be taken to the Circuit Court.

Plan Reported for Sale of the Seattle, Renton & Southern Railway

Announcement was made in Seattle, Wash., on Oct. 23, 1912, that E. M. Mills, Chicago, Ill., a director of the Seattle, Renton & Southern Railway, was en route to Chicago vested with authority from the bondholders of the company and acting as a representative of Peabody, Houghtaling & Company, Chicago, to conduct negotiations with the city for the extension of the railway and its sale to the city. It was stated unofficially that the plan under consideration was to have the Public Service Commission appraise the property and add to such value the cost of extensions considered essential to the residents of the Rainier Valley, the bondholders to advance the funds to complete the extensions and sell the property to the city at the value thus fixed, accepting as a first payment such part of the purchase price as the city might have available, the balance to be met by deferred payments. The property is in the hands of receivers and only recently proceedings were begun to foreclose the first mortgage under which $825,000 of 5 per cent bonds are outstanding.

Suit to Annul Chicago 1907 Ordinance Lost.—Judge Kohlsaat in the United States Circuit Court of Appeals at Chicago has decided against Charles H. Venner, a stockholder of the Chicago City Railway residing in New York, N. Y., in his suit to have the 1907 Chicago traction ordinance annulled.

Automatic Stop Demonstration.—An automatic stop installation was demonstrated on the Chicago Great Western Railroad near De Kalb, Ill., on Oct. 24, 1912. This installation comprises a series of short third-rails energized through relays controlled by track circuits similar to steam-railway block-signal control. The installation was made by the Gollos Railway Signal Company, Chicago, Ill.

Judgments in St. Louis Mill-Tax Suits.—Judgments aggregating $975,819 for taxes accrued from 1904 to 1911 under the mill-tax ordinances were rendered on Oct. 15, 1912, against the United Railways, St. Louis, Mo., by Judge Shields in the Circuit Court in five suits against the company. Another judgment against the St. Louis & Suburban Railway is for $18,891. Interest at 6 per cent is to be added to these amounts. The cases will be appealed.

Eugene Celebrates Entrance of Oregon Electric Railway.—The celebration of the entrance of the Oregon Electric Railway into Eugene, referred to briefly in the ELECTRIC RAILWAY JOURNAL of Oct. 26, 1912, page 928, was held on Oct. 15, that being the first day passengers were carried over the line. It is estimated there were at least 12,000 visitors from Portland, Salem and other cities throughout the valley. A banquet was tendered to the officers of the company in the Commercial Club rooms, after which a parade was held. Moving pictures were taken of the parade

Work Started on Brooklyn Subway Extension.—The Public Service Commission for the First District of New York on Oct. 26 started work on the extension of the Fourth Avenue Subway in Brooklyn, contracts for which were recently let to the Degnon Contracting Company. Ground was broken in Fourth Avenue near Bay Ridge Avenue. The new work is in great part a four-track subway, extending from the present terminus of the Fourth Avenue Subway at Forty-third Street and Fourth Avenue down the latter thoroughfare to Eighty-ninth Street. It will cost upward of $3,000,000.

Power Contract at Worcester.—The Worcester (Mass.) Consolidated Street Railway has entered into a contract with the Connecticut River Transmission Company for the purchase of power for the use of the street railway. The operation of the Fremont Street, Leominster, West Berlin, Northboro and Charlton City plants of the Worcester Consolidated Street Railway is to be discontinued and they are to be held in reserve for emergency use. The plan is to operate the Millsbury plant to its full capacity and to purchase from the Connecticut River Transmission Company such other power as is necessary for the operation of the railway lines.

Construction of Westchester Northern Railway Approved.—The directors of the New York, New Haven & Hartford Railroad are reported to have decided to proceed immediately with the construction of the Westchester Northern Railway as a continuation of the New York, Westchester & Boston Railway at a cost of about $6,000,000. The Westchester Northern Railway will extend from the White Plains terminal of the New York, Westchester & Boston Railway northerly through Harrison, North Castle, Bedford, Pound Ridge and Lewisboro in New York and Greenwich and Litchfield in Connecticut and to Danbury, where connection will be made with the New York, New Haven & Hartford Railroad.

Elevated Line Proposed Between Philadelphia and Darby.—Representatives of the Woodland Avenue and Darby Business Men's Association called on A. Merritt Taylor, transit commissioner of Philadelphia, Pa., on Oct. 24, 1912, to take up with him the question of providing rapid transit facilities for Darby and the northeastern section of the city, but as only part of the committee appeared, owing to a misunderstanding, Mr. Taylor has arranged to hold another meeting on Nov. 8, 1912. It was stated after the meeting that an estimate of $2,400,000 had been secured for the construction of 4 miles of elevated railway from Thirty-second Street and Market Street, Philadelphia, to Darby. Benjamin H. Renshaw, Common Councilman from the Fortieth Ward, although not a member of the committee, expressed the opinion that the business interests in the district which would be traversed by the line could arrange to finance the proposed line.

Chicago Wage Arbitration Board Holds First Meeting.—The first meeting of the board of arbitrators in the Chicago railway wage controversy was held on Oct. 29. The Chicago City Railway was represented by Harvey B. Fleming, of the board, and N. G. Moore, attorney at law; the employees by Judge Kickham Scanlan, of the board, and W. D. Mahon. Chief Justice Orrin N. Carter, of the Illinois Supreme Court, presided. It was decided that the representatives of the employees should present their argument first and that all meetings of the board should be open to the public. A question left undecided was whether the city should be officially represented at the hearings. The attorney for the company objected to the city being represented on the grounds that the city was not a party to the arbitration agreement. The meetings will be held in the court room of Judge Scanlan at the County Building. Mr. Mahon objected at first to the proposal to adjourn until Oct. 31, but the attorney for the company said that the officers of the company would be detained in the merger proceedings before the local transportation committee of the Chicago City Council.

Novel Plan Advanced for Construction of San Pedro Line in Los Angeles.—City Attorney Shenk and Special Counsel Hewitt, of Los Angeles, Cal., have proposed a plan for the construction of a railway on San Pedro Street, between Aliso and Ninth Streets, Los Angeles, Cal., which provides that the city shall award a contract to the Pacific Electric Railway to construct the railway, paying the company $10,000 in advance and agreeing to make deferred payments, the final payment to be made before the close of the next fiscal year. The city would then by ordinance or direct franchise give permission to the Pacific Electric Railway to operate its cars over the route. Mayor Alexander and some of the Councilmen expressed the opinion that there should be a year-to-year agreement for the operation of the line until such time as the city shall need the road for its proposed municipal line to the harbor. Paul Shoup, president of the Pacific Electric Railway, declares the tenure must be for a definite time, and that he believes it should be for not less than seven years. He demands sufficient time to allow the company to build its permanent outlet for suburban traffic before being required to give up the use of San Pedro Street.

Inspection Trip of Au Sable River Development.—Fifteen directors of the Commonwealth Power, Railway & Light Company, Grand Rapids, Mich., recently completed an inspection of the dams being constructed on the Au Sable River. The party came aboard a special car from New York and proceeded to Grayling, where they took houseboats and went down the Au Sable River. The party included among its members Anton G. Hodenpyl, George E. Hardy, B. C. Cobb, John C. Weadock, New York; E. W. Clark and Frank Silliman, Philadelphia; W. A. Foote and N. S. Potter, Jackson; E. C. Nichols, Battle Creek; L. H. Withey and Claude Hamilton, Grand Rapids; John S. Barr, Louisville, Ky.; John R. Graham, Bangor, Me.; Edward F. Loud, Au Sable, and C. W. Tippy, Detroit. John F. Collins, Jackson, vice-president and general manager of the Michigan United Traction Company, accompanied the party. Cooke's dam and Five Channels dam have been completed and are in operation. These dams develop 21,000 hp. The third—Loud's dam—now in course of construction, will develop 9000 hp. Cooke's dam, which has been in operation since last spring, develops 12,000 hp, which is transmitted at 140,000 volts 98 miles to Zilwaukee. Fourteen dams will have been constructed when this work is completed, and the output will be 140,000 hp. The annual meeting was held during the trip and the following officers and members of the executive committee were elected: President, Anton G. Hodenpyl; vice-president, E. W. Clark; second vice-president, George E. Hardy; secretary, C. M. Clark; treasurer, Jacob Hekma; executive committee, Anton G. Hodenpyl, George E. Hardy, W. A. Foote, W. M. Eaton, C. M. Clark and B. C. Cobb.

San Francisco Municipal Railroad Expenditures.—Mayor Rolph, of San Francisco, Cal., has obtained a statement of the amounts expended and set aside out of the Geary Street Municipal Railroad bond fund, which gives the following figures: Bonds authorized, $2,020,000, all being sold, and the premiums increasing the available total by $2,341.50; appropriated to Board of Public Works for materials and construction, $1,492,427; expenditures and liabilities incurred under these appropriations, $1,405,996.56; expended by Board of Supervisors for lands, $111,885, and for miscellaneous matters, $2,226.29; expenses of city attorney's trip to Washington, D. C., $500; portion of Bion J. Arnold's fee for report on cars, $1,171.50; appropriated to defray part of city engineer's salary, $1,250; surplus in appropriations, $86,430.44; returned to fund on account of house-moving rebate, $39.05; available remainder in fund, $499,291.20. Among the items of expenditure are the following: Purchase of steel rails and freight on same, $116,620.08; rail joints and fastenings, $17,935; tubular steel trolley poles, $18,773.80; copper wire, $6,850.83; additional trolley poles and wire, $27,951.75; rail bonds, $4,422.50 and $1,510.70 more to be paid; redwood crossties, $18,049.32 and $5,788.80 additional to be paid; tie plates and rail spikes, $8,498.70 and $2,304 additional to be paid; hauling rails, $5,710.83; hauling and piling ties, $2,028.79; tie rods and nuts, $2,022.79 and $656.25 additional to be paid; curves, switches, etc., $45,713; setting trolley poles, $3,509; track specials, $8,618; electric conductors, $60,304.47; rail bonds, $1,510.70; plans and specifications, $21,470.13; track construction, $376,187.25; paving right-of-way, $63,585.89; purchase of cars, to cost $337,270; car house, $217,037.85; underground conduit, $29,981.

SEMINARY ROOM.
MECHANICAL ENGINEERING DEPARTMENT

Financial and Corporate

Stock and Money Markets.

Oct. 30, 1912.

The market for securities traded in on the New York Stock Exchange sold off sharply to-day after the first few moments of trading and continued weak for some time. Toward the close the market recovered rapidly, but the quotations for some stocks at the close of the market to-day were below the final prices of Tuesday. There was further tightening to-day in the money market. A feature was the placing of ninety-day loans on all industrial collateral on terms equal to a rate of 6¼ per cent. Rates in the money market to-day were: Call, 5¼ to 6 per cent; sixty and ninety days, 5¾ to 6 per cent; five and six months, 5½ to 6 per cent.

In Philadelphia the market was broad to-day, but the volume of transactions was not large. Trading in the traction issues was not especially active.

In the Boston market there was very little trading in the railroad issues. The market for bonds was dull.

In the Chicago market to-day the volume of transactions was small and the market very narrow.

In the Baltimore market to-day small sales were recorded of United Railways issues and of Washington, Baltimore & Annapolis preferred. The bond transactions totaled $131,000.

Quotations of traction and manufacturing securities as compared with last week follow:

	Oct. 23.	Oct. 30.
American Brake Shoe & Foundry (common)	a97¾	96
American Brake Shoe & Foundry (preferred)	a155	145
American Cities Company (common)	a31⅞	37¼
American Cities Company (preferred)	a78¼	79¾
American Light & Traction Company (common)	a435	435
American Light & Traction Company (preferred)	a110½	110½
American Railways Company	a43½	40½
Aurora, Elgin & Chicago Railroad (common)	a45¾	42½
Aurora, Elgin & Chicago Railroad (preferred)	a90	89½
Boston Elevated Railway	a124	122½
Boston Suburban Electric Companies (common)	a15	a15
Boston Suburban Electric Companies (preferred)	a78	a78
Boston & Worcester Electric Companies (common)	*10	a78
Boston & Worcester Electric Companies (preferred)	a50	8½
Brooklyn Rapid Transit Company	a89⅞	89
Capital Traction Company, Washington	a123¼	123
Chicago City Railway	a170	150
Chicago Elevated Railways (common)	a35	32
Chicago Elevated Railways (preferred)	a95	85
Chicago Railways, ptcptg., ctf. 1	a95	87
Chicago Railways, ptcptg., ctf. 2	a26¼	24½
Chicago Railways, ptcptg., ctf. 3	a9½	8½
Chicago Railways, ptcptg., ctf. 4	a4	3½
Cincinnati Street Railway	a128	128
Cleveland Railway	a106½	106⅝
Cleveland, Southwestern & Columbus Ry. (common)	*6½	6½
Cleveland, Southwestern & Columbus Ry. (preferred)	*35	35
Columbus Railway & Light Company	a55	55
Columbus Railway (common)	a70	70
Columbus Railway (preferred)	a90	90
Denver & Northwestern Railway	*125	125
Detroit United Railway	70	80
General Electric Company	180½	180
Georgia Railway & Electric Company (common)	a126	125
Georgia Railway & Electric Company (preferred)	a84¼	83½
Interborough Metropolitan Company (common)	20	20
Interborough Metropolitan Company (preferred)	64	64½
International Traction Co., Buffalo, 4% bonds rcts	75	75
Kansas City Railway & Light Company (common)	a26	20
Kansas City Railway & Light Company (preferred)	40	40
Lake Shore Electric Railway (common)	*8	8
Lake Shore Electric Railway (1st preferred)	a92	92
Lake Shore Electric Railway (2d preferred)	a28¼	28¼
Manhattan Railway	132	132½
Massachusetts Electric Companies (common)	a19½	18
Massachusetts Electric Companies (preferred)	a77½	76
Milwaukee Electric Railway & Light (preferred)	102	102
Norfolk Railway & Light Company	28	28
North American Company	83½	83½
Northern Ohio Light & Traction Company (common)	a72	65
Northern Ohio Light & Traction Company (preferred)	a105	100
Philadelphia Company, Pittsburgh (common)	a51	50½
Philadelphia Company, Pittsburgh (preferred)	a44½	43⅞
Philadelphia Rapid Transit Company	a27⅞	27½
Portland Railway, Light & Power Company	66	66
Public Service Corporation	a118	118
Third Avenue Railway, New York	39	37¼
Toledo Railway & Light Company	5½	5
Twin City Rapid Transit Co., Minneapolis (common)	a108	105
Union Traction Company of Indiana (common)	11	11
Union Traction Company of Indiana (1st preferred)	88	88
Union Traction Company of Indiana (2d preferred)	42	42
United Rys. & Electric Company (Baltimore)	a26⅛	25¾
United Rys. Inv. Company (common)	38	37
United Rys. Inv. Company (preferred)	66	65½
Virginia Railway & Power Company (common)	*50¼	*50¼
Virginia Railway & Power Company (preferred)	87½	87½
Washington Ry. & Electric Company (common)	a90	89¾
Washington Ry. & Electric Company (preferred)	a91¼	89¾
West End Street Railway, Boston (common)	a80½	80
West End Street Railway, Boston (preferred)	a98	97
Westinghouse Elec. & Mfg. Company	82¾	82
Westinghouse Elec. & Mfg. Company (1st preferred)	a124	125

* Last sale. a Asked.

ANNUAL REPORT

Aurora, Elgin & Chicago Railroad

Results of operation of the Aurora, Elgin & Chicago Railroad for the year ended June 30, 1912, were as follows:

Gross earnings		$1,892,387
Operating expenses and taxes		1,137,172
Net earnings		$755,215
Other income		8,241
Gross income		$763,456
Deductions from income		386,127
Net income		$377,329
Profit and loss surplus at beginning of year		354,724
Profit and loss credits		6,486
Profit and loss gross surplus		$738,539
Profit and loss charges:		
Dividends	$279,000	
Other	1,354	280,354
Profit and loss surplus at end of year		$458,185

Ratio of operating expenses and taxes to gross earnings per cent, 60.

A note published in the report says: "While it is the company's policy to charge against its operations the amounts expended in the current maintenance of its way and structures and equipment, no provision, other than such renewals as are included therein, is made in its operating accounts for depreciation."

L. J. Wolf, the president, says in part in his report to stockholders:

"To facilitate the operation of trains to and from the cemetery branch, a cross-over was installed on the Chicago division at Bellwood, and, in harmony with the policy of gradually extending the automatic block signal protection over the entire third-rail division, a block of automatic track-circuit signals was installed at this point.

"Six additional blocks of trolley contact block signals were installed on the Fox Rixer division.

"Twelve old-type crossing alarm bells were replaced with the most modern and reliable device obtainable and four additional crossing alarm bells were installed. All of these provide an audible as well as a visual signal.

"In anticipation of the coal miners' strike last spring, a large supply of coal was accumulated, but the electrically operated locomotive crane included in the coal and ash handling equipment enabled us to store and rehandle the coal much more expeditiously and economically than heretofore.

"A rubble dam was constructed just below the condenser water intake, thus raising the water in Fox River 4 ft. above its former level and affording ample and cooler condensing water, besides giving the added attraction of boating at Glenwood Park.

"The load on the power plant is growing steadily and is rapidly approaching the maximum generating capacity. Contracts have been let for a 60-ft. addition to the engine room, an enlargement of the screen house and the construction of a new and larger intake and discharge waterway; also for an 8300-kw turbo-generator set together with surface condenser and auxiliaries, transformers and switchboard. It is expected that these will be ready for operation before the end of the winter, thus approximately doubling the present capacity of the generating station.

"For the cleaning of substation apparatus, each substation has been equipped with a motor-driven air compressor with storage tanks.

"An electrically driven Universal wood-working machine was installed at the Aurora shops.

"Plans and specifications are being prepared for five to ten passenger cars to be purchased during the current fiscal year.

"The following service equipment was purchased: Five drop-bottom steel gondolas, 100,000 lb. capacity; twenty side-dump wooden gondolas, 80,000 lb. capacity; one trailer express car to be used in milk service.

"Electric buzzer train signals were installed in all passenger cars, permitting motormen to be signaled from any car of a train. All passenger cars were fitted with destination and classification signs.

"Experiments to insure the continuity of car lighting when cars pass over gaps in the third-rail at road crossings are meeting with considerable success. The elimination of

these interruptions would materially add to the attractiveness of the service.

"Automotoneers were installed on all interurban cars on the Fox River division.

"A handsome brick station building is being erected at Wheaton, which will compare favorably with the new station directly opposite recently erected by the Chicago & Northwestern Railway.

"The option on the Wheaton general office building was exercised and the interior of the building was remodeled for permanent office quarters.

"A traffic office was opened in the Fifth Avenue terminal station, Chicago, where particular attention is being given to the development of the freight, express and excursion business.

"A freight office was established at Fifty-second Avenue, Chicago.

"The volume of express business which is conducted by the United States Express Company has been normal.

"The volume of carload freight business—particularly of coal, stone and gravel—shows a material increase and justifies the continuance of the policy of installing industrial switches at all points where a satisfactory volume of business is assured.

"The excursion and picnic business was the largest in the history of the company and the prospects for the remainder of the season are very good.

"The company has adhered to its policy of making liberal expenditures for maintenance, with the result that the track, bridges, distribution system, rolling stock and other property of the company were never in better condition than at present."

Reorganization of Buffalo & Lake Erie Traction Company Proposed

As the Buffalo & Lake Erie Traction Company will be unable to meet all of the interest due on Nov. 1, 1912, on its first and refunding mortgage 5 per cent thirty-year gold bonds, Alvin W. Krech, Arthur V. Morton, W. N. Ely, Harrison Nesbit, George R. Teller and Rodman E. Griscom, at the request of the holders of a large amount of the bonds, have agreed to act as a committee to receive deposits of the bonds for the protection of the interests of the holders. In its request for the deposit of the bonds the committee says in part:

"Owing to the long deferred revival of business activities in the territory which is served by the lines of the company, a reorganization of its affairs has become inevitable, as the company requires additional funds adequately to handle its future business and to comply with the provisions of certain of its franchises.

"The funds so required cannot be secured by further issue of its bonds, owing to their low market price caused by the above-mentioned condition of the company. For this reason a comprehensive readjustment of the company's affairs has become necessary, and to that end the properties of the company are being examined by engineers of the highest standing, and as soon as completed their reports and suggestions will be placed at the disposal of the committee.

"The company's bankers, who are also the largest individual holders of these bonds, for some months have been engaged upon a plan for the readjustment of the affairs of the company which, if successful, would be greatly to the advantage of the bondholders of the company, provided that they will co-operate by depositing their bonds with the committee. The plan above referred to as yet cannot be presented, as its development must be largely guided by the above-mentioned engineers' report, and as its consummation will require the approval of the Public Service Commission."

The Equitable Trust Company, New York, N. Y., has been designated by the committee as depositary, with the Girard Trust Company, Philadelphia, Pa., as sub-depositary. The committee has arranged to advance to the holders of certificates of deposit a sum equivalent to the interest due on Nov. 1, 1912, on the bonds on deposit.

The communication addressed by the committee to the bondholders was dated Oct. 25, 1912. Alvin W. Krech is chairman of the committee.

Chicago Surface Railway Merger Proceedings

The proceedings looking to the merger of the surface railways of Chicago have reached a point where propositions to be embodied in the unification ordinance are being presented. Practically all the provisions contended for by the local transportation committee of the Chicago City Council will probably be accepted by the railways. These include universal transfers and through routing. The representatives of the companies, through Leonard A. Busby, president of the Chicago City Railway, have requested the city to guarantee a return of 7 per cent on the value of the properties as determined by the Board of Supervising Engineers. Mr. Busby in addressing the committee said:

"There have been many changes in conditions since the 1907 ordinance was passed. The companies are now forced to spend a great deal for street improvements and for cleaning and paving the streets for miles when the operation of the cars does not injure the street. From another viewpoint, the two companies have put about $75,000,000 into the property in one way or another. That is, our capital account has gone up by leaps. The gross income was advanced steadily with the growth of the city and the extension of our business. It could grow no other way. The result of this natural growth in the earnings and rapid increase in capitalization has been a gradual decrease in the rate of net earnings from 10.37 per cent to 7.3 per cent a year. We cannot permit it to go below 7 per cent.

"I feel that the city realizes the benefit to its citizens from the through routing and universal transfers which would result from a unification of the surface lines and should guarantee us 7 per cent. Then, if there should be a deficit to us I propose that the city agree to make up that year's deficit the following year from its own 55 per cent profit."

The chairman of the committee on local transportation said that the public desired improved service and asked if the companies were ready to consider a merger. In reply Mr. Busby said that they were ready to proceed only on the basis of a guarantee of the return to the company.

In order to emphasize the point which he made in regard to the decrease in the rate of return per year, Mr. Busby presented the following table:

Years Ended	Average Valuation.	Net Earnings.	Rate per Annum.
Jan. 31, 1908	$24,720,169	$2,563,627	10.37
Jan. 31, 1909	37,337,247	3,126,172	8.37
Jan. 31, 1910	44,090,300	3,239,835	7.35
Jan. 31, 1911	48,751,021	3,626,066	7.44
Jan. 31, 1912	51,621,284	3,767,703	7.30

The conference was to be resumed on Nov. 1, when figures prepared by the Chicago Railways to cover the same subjects were to be presented and both reports checked by the city auditors.

Los Angeles Operating Statistics

The Board of Public Utility Commissioners of Los Angeles, Cal., has made public a synopsis of the report of the Los Angeles Railway Corporation for the last fiscal year filed with the commission in accordance with the requirements of an ordinance passed by the City Council calling upon the commission to appraise the physical property of the company and to determine from the appraisal and from its analysis of the earnings of the company whether the present rates of fare are reasonable and just.

The operating statistics show that during the year the corporation operated 25,590,783 car-miles and carried 122,702,682 revenue passengers and 2,344,118 free passengers, such as policemen, firemen, postmen, etc., as well as 2,412,308 employees. Free transfers to the number of 35,312,622 were collected. The average fare of the revenue passengers was 4.966 cents and of all passengers 3.857 cents. The operating revenue per car-mile was 24.248 cents, and the operating expense per car-mile 16.523 cents. The ratio of operating expenses to operating revenue was 68.14 per cent. The aggregate salaries and wages paid during the year totaled $2,989,374. The corporation operates 802 cars, of which 761 are passenger cars, mostly of the combination closed and open type. The corporation expended for improvements and betterments $1,219,531, and the extensions to the system made through the subsidiary construction company, the City Railway, amounted to $851,187.08, making a total

expenditure for new construction of $20,070,718 during the year.

The Los Angeles Railway Corporation was organized under the laws of the State of California on Nov. 7, 1910. The board of directors consists of: H. E. Huntington, president; Howard Huntington, vice-president and general manager; W. E. Dunn, second vice-president; C. A. Henderson, secretary and treasurer; Albert Crutcher, G. C. Ward, I. E. Brown, G. J. Kuhrts, chief engineer, and John J. Akin, general superintendent. The corporation operates 354.84 miles of single track, of which 6.59 have been built during the year covered by the report.

The capital stock of the corporation consists of $20,000,000 of stock, all of it outstanding, upon which a 2 per cent dividend, amounting to $400,000, was paid during the year. The funded debt consists of an issue of $20,000,000 of 5 per cent first-mortgage bonds, issued in 1910 and due in 1940. Of this $20,000,000 bond issue, $14,500,000 were taken by the Los Angeles Railway in payment for its properties, and $5,500,000 were put in escrow to buy or to offset an equal amount of underlying bonds as follows: (a) Five thousand first-mortgage 5 per cent gold bolds of the Los Angeles Railway of par value of $1,000 each, dated Jan. 17, 1899, due Oct. 1, 1938. Amount of this issue, $5,000,000. (b) Two hundred and fifty first-mortgage 6 per cent gold bonds of the Los Angeles Traction Company of the par value of $1,000 each, dated May 1, 1895, due May 1, 1915. Amount of this issue, $250,000. (c) Two hundred and fifty first consolidated mortgage 5 per cent gold bonds of the Los Angeles Traction Company of the par value of $1,000 each, dated Dec. 1, 1898, due Dec. 1, 1938. Amount of this issue, $250,000.

A sinking fund is required consisting of $10,000 per month to be paid either in cash or by the corporation's bonds, to be used for the redemption of these bonds. The interest upon the bonds in the sinking fund accumulates as an addition to the fund. All requirements for sinking funds for the underlying bonds are to be met out of the limit of $10,000 per month.

To finance future extensions and additions, the City Railway was organized with an authorized bond issue of $5,000,000, dated Feb. 1, 1911, and due Feb. 1, 1941, bearing interest at the rate of 5 per cent, payable semi-annually. The interest upon these bonds is to be paid by the Los Angeles Railway Corporation in lieu of rental upon the tracks, equipment and other physical property purchased by the proceeds from the sale of the City Railway Company's bonds at par.

Alton, Jacksonville & Peoria Railway, Alton, Ill.—The Alton Banking & Trust Company, Alton, Ill., trustee under the mortgage given by the Alton, Jacksonville & Peoria Railway to secure an issue of $600,000 of bonds, the interest on which is in default, has begun proceedings in the Madison County Circuit Court looking toward the sale of the property under foreclosure.

Boston (Mass.) Elevated Railway.—The annual meeting of the stockholders of the Boston Elevated Railway will be held on Nov. 4, 1912. The stockholders will be asked to act in regard to increasing the capital stock of the company by the issue of additional shares of stock of the par value of not more than $4,000,000, and also to authorize the issue of bonds of the company of an aggregate face value of not more than $5,000,000.

Central Park, North & East River Railroad, New York, N. Y.—The committee of stockholders of the Central Park, North & East River Railroad appointed at the meeting held on Oct. 21, 1912, as noted in the ELECTRIC RAILWAY JOURNAL of Oct. 26, 1912, page 926, has obtained a stay of two weeks of the foreclosure sale of the property of the company set for Oct. 31. In the meantime the committee will decide whether or not a reorganization of the property is feasible and report back to the stockholders, who will probably be asked to deposit their holdings subject to use by the committee.

Chicago (Ill.) Railways.—At the annual meeting of the trustees held on Oct. 24, 1912, for the election of directors, Henry A. Blair, John M. Roach, Seymour Morris and A. B. Jones were re-elected and Charles L. Hutchinson, R. G. Chandler, Charles C. Adsit, Edward S. Hunter and R. W. Hosmer were elected in place of Williston Fish, Markham B. Orde, Frank L. Hupp, W. W. Jones and John Rees. The officers will organize on Nov. 4, 1912.

Coney Island & Brooklyn Railroad, Brooklyn, N. Y.—All of the directors of the Coney Island & Brooklyn Railroad were re-elected at the recent annual meeting except Guy Richards, who resigned. The board of directors now consists of thirteen members, but it is proposed to reduce this number to nine to be constituted as follows: S. W. Huff, George H. Prentiss, J. H. Walbridge, Harold Fitzgerald, Allan McCulloch, William H. Day, Duncan G. Cannon, John A. Thake and E. W. Glucas.

Georgia Railway & Electric Company, Atlanta, Ga.—The Georgia Railway & Electric Company has sold to Charles C. Harrison, Jr., & Company, Philadelphia, Pa., $250,000 of refunding and improvement mortgage 5 per cent bonds due in 1949.

Indianapolis, New Castle & Eastern Traction Company, Indianapolis, Ind.—Negotiations are reported to have been concluded by which the property of the Indianapolis, New Castle & Eastern Traction Company will be leased to the Union Traction Company, of Indiana, for 999 years. The terms of the proposed lease have not been made public.

Northern Electric Railway, Chico, Cal.—The Railroad Commission of California on Oct. 15, 1912, held a hearing in regard to the application of the Northern Electric Railway for permission to issue $8,000,000 of bonds. T. T. C. Gregory conducted the case for the company. He is president of the Vallejo & Northern Railway. According to Mr. Gregory it was desired to issue $5,500,000 of the bonds to provide funds to construct the Vallejo & Northern Railway as an extension of the Northern Electric Railway and to issue the remaining $2,500,000 of bonds to retire outstanding notes. He is quoted to the effect that the flotaton of the bonds had been arranged on the basis of $80 for the $5,500,000 issue and $86 for the $2,500,000 issue. The commission reserved decision.

Otsego & Herkimer Railroad, Hartwick, N. Y.—On Oct. 29, 1912, the Public Service Commission held a hearing on the application of the Otsego & Herkimer Railroad to make a mortgage for $1,500,000 and to issue thereunder $1,200,000 of fifty-year 5 per cent bonds. Attorney Louis F. Reed stated that the company proposed to take over certain property of the Hartwick Power Company and that the unification of these properties followed the plan proposed by the commission about two years ago. He explained that the motives actuating the proposed transfer were the securing of the power plant by the railroad company, which has heretofore been dependent upon the power company for its current; the difficulty of marketing the power company's securities because its success is practically dependent upon the business secured from one customer; the failure of the railroad to find a market for its securities because it had no power plant, and the belief that the bonds under the proposed mortgage will be more attractive than separate securities of the railroad and power companies. He pointed out that in 1911 the earnings of the power company were $50,000, which amount was sufficient to meet 5 per cent interest on the $1,000,000 of bonds. The proceeds of the remaining bonds are to be used to meet outstanding obligations of the Otsego & Herkimer Railroad. The commission has taken the matter under advisement.

Puget Sound Traction, Light & Power Company, Seattle, Wash.—The stockholders of the Puget Sound Traction, Light & Power Company have authorized the issuance of $1,136,400 of additional preferred stock to be offered to stockholders of record of Oct. 16 at par on the basis of one share of new preferred stock to each holder of twenty-five shares of both classes of stock. Payment for the new stock is to be made in two instalments of $50 each on Dec. 2, 1912, and Jan. 16, 1913.

United Railways & Electric Company, Baltimore, Md.—The United Railways & Electric Company has declared a dividend of 1½ per cent on the $15,000,000 of common stock, payable on Nov. 12, 1912, to holders of record of Nov. 2. This is the same amount as paid in May, 1912, when the first distribution was made.

Worcester (Mass.) Consolidated Street Railway.—The Worcester Consolidated Street Railway has petitioned the Massachusetts Railroad Commission to approve the acqui-

sition of the property of the Quinsigamond Park Company and certain real estate owned by the Electric Manufacturing Company, the board to determine the amount of first and refunding 4½ per cent bonds dated Aug. 1, 1910, to be issued to provide funds to take over the properties previously mentioned.

Dividends Declared

American Utilities Company, New York, N. Y., quarterly, 1½ per cent, preferred.

Cape Breton Electric Company, Ltd., Sydney, N. S., preferred, $3; common, $2; common, extra, $1.

Cities Service Company, New York, N. Y., monthly, one-half of 1 per cent, preferred; monthly, one-third of 1 per cent. common.

Detroit (Mich.) United Railway Company, quarterly, 1¼ per cent.

Electric Bond & Share Company, New York, N. Y., quarterly, 1½ per cent, preferred.

Hartford & Springfield Street Railway, Warehouse Point, Conn., 2 per cent, preferred.

Lincoln (Neb.) Traction Company, quarterly, 1½ per cent, preferred.

Ohio Traction Company, Cincinnati, Ohio, quarterly, 1¼ per cent., preferred.

Public Service Company of Northern Illinois, Chicago, Ill., quarterly, 1½ per cent, preferred; quarterly, 1 per cent, common.

Tampa (Fla.) Electric Company, quarterly, 2½ per cent.

United Railways & Electric Company, Baltimore, Md., 75 cents, common.

West Penn Railways, Pittsburgh, Pa., quarterly, 1¼ per cent, preferred.

ELECTRIC RAILWAY MONTHLY EARNINGS

AMERICAN RAILWAYS.

Period.			Gross Earnings.	Operating Expenses.	Net Earnings.	Fixed Charges.	Net Surplus.
1m.,	Sept.,	'12	$428,827	.....	.....	.....	.....
1 "	"	'11	416,738	.....	.....	.....	.....
3 "	"	'12	1,329,068	.....	.....	.....	.....
3 "	"	'11	1,287,638	.....	.....	.....	.....

ATLANTIC SHORE RAILWAY.

1m.,	Sept.,	'12	$35,734	$22,956	$12,777	$465	$12,312
1 "	"	'11	37,699	27,115	10,585	581	10,004

BATON ROUGE ELECTRIC COMPANY.

1m.,	Aug.,	'12	$11,767	*$7,519	$4,248	$1,730	$2,518
1 "	"	'11	9,997	*6,445	3,552	1,729	1,823
12 "	"	'12	139,584	*84,327	55,257	20,759	34,498
12 "	"	'11	114,876	*74,031	40,845	20,676	20,169

COLUMBUS (GA.) ELECTRIC COMPANY.

1m.,	Aug.	'12	$50,824	*$23,313	$21,445	$18,952	$2,493
1 "	"	'11	49,085	*22,671	16,903	18,527	†1,624
12 "	"	'12	600,786	*268,302	259,248	223,853	35,395
12 "	"	'11	531,367	*225,807	249,573	178,846	70,727

GALVESTON-HOUSTON ELECTRIC COMPANY.

1m.,	Aug.,	'12	$199,208	*$103,921	$95,287	$33,666	$61,621
1 "	"	'11	142,326	*82,559	59,766	18,837	40,929
12 "	"	'12	1,835,280	*1,099,285	735,995	347,511	388,484
12 "	"	'11	1,447,727	*912,125	535,602	238,344	297,258

GALVESTON (TEX.) ELECTRIC COMPANY.

1m.,	Aug.,	'12	$60,257	*$25,384	$34,873	$7,944	$26,928
1 "	"	'11	50,896	*23,505	27,391	6,881	20,510
12 "	"	'12	468,101	*264,194	203,907	92,584	111,323
12 "	"	'11	419,940	*241,022	178,418	83,602	94,816

HOUGHTON (MICH.) TRACTION COMPANY.

1m.,	Aug.,	'12	$28,314	*$13,303	$15,011	$5,677	$9,334
1 "	"	'11	28,534	*15,718	12,816	5,227	7,589
12 "	"	'12	300,451	*176,210	124,241	65,370	58,871
12 "	"	'11	304,956	*177,905	127,051	62,770	64,281

LOUISVILLE (KY.) RAILWAY.

1m.,	Sept.,	'12	$272,691	$151,251	$121,440	$76,416	$70,119
1 "	"	'11	267,313	155,640	111,673	70,249	67,252

PHILADELPHIA RAPID TRANSIT COMPPANY.

1m.,	Sept.,	'12	$1,926,044	$1,127,154	$798,890	$762,039	$36,850
1 "	"	'11	1,899,351	1,127,563	771,789	737,198	34,591
3 "	"	'12	5,758,078	3,429,346	2,328,733	2,277,322	51,411
3 "	"	'11	5,551,157	3,398,547	2,152,611	2,211,171	58,560

VIRGINIA RAILWAY & POWER COMPANY.

1m.,	Aug.,	'12	$416,856	$207,513	$209,344	.....	.....
1 "	"	'11	394,473	206,130	188,543	.....	.....
2 "	"	'12	832,585	419,228	413,357	.....	.....
2 "	"	'11	803,302	415,864	387,439	.....	.....

*Includes taxes. †Deficit

Traffic and Transportation

Turnstile Order of the Ohio Commission

The opinion and order of the Public Service Commission of Ohio to the People's Railway, Dayton, Ohio, delivered on Oct. 8, 1912, in regard to the use of turnstiles and referred to in the Electric Railway Journal of Oct. 19, 1912, page 897, follow:

"The commission having on May 27, 1912, commenced, on its own initiative, an investigation of the management and operation of the People's Railway, Dayton, Ohio, with respect to the safety and security of the public, and especially in the matter of the use by said People's Railway upon its cars of turnstiles at the point of ingress, and due notice of the time and place of said investigation having been given said company, and said company having appeared, by representatives duly authorized, at said investigation, and the commission having considered the evidence, the exhibits and the arguments of counsel, and having made such further inquiry and investigation as it deemed proper, finds:

"First—That said People's Railway has placed and is using upon its cars, at the point and place of ingress, a certain device and apparatus made of wood and metal, known and designated as a turnstile, for the purpose of registering the persons entering said cars.

"Second—That said turnstiles, so constructed of wood and metal, are so attached to the vestibules of said cars as to form a rigid obstacle and impassable barrier in the way of passengers or persons seeking to enter or leave said cars until the machinery of said turnstiles is released, allowing the same to turn or the arms thereof to fall.

"Third—That said turnstiles are so placed and so constructed as to prevent their being turned by the passengers or persons attempting to enter the car until the conductor releases the machinery, thus resulting at times in the bruising or injuring of the passenger or person so attempting to enter the car when said passenger or person and the conductor fail to act in exact unison.

"Fourth—That said turnstiles are so placed and constructed as to bar the passage and prevent the egress of any person or persons at the end of the car where said turnstile is located, thus creating an additional element of danger in case of accident or other emergency necessitating prompt unloading or detraining of passengers. It is, therefore,

"Ordered, That said People's Railway be, and it hereby is, notified and required to remove said turnstiles from its cars used to carry passengers on its line of street railway in Dayton, Ohio. It is further

"Ordered, That the terms, conditions and provisions of this order be fully executed and complied with and obeyed by said People's Railway on or before Nov. 1, 1912."

Booklet on New Transfer Regulations in Denver

The Denver (Col.) City Tramway has issued a booklet explaining the new transfer regulations which will go into effect within a few days as a result of the recent negotiations between the city and the company. These regulations are designed to facilitate the issuance and use of transfers and to promote the convenience of the public. The booklet says in part:

"Transfers should be secured when paying fare, for the reason that it both economizes the conductor's time and affords passengers ample opportunity to examine ticket and make sure it has been correctly canceled. Conductor will, however, upon request, issue a transfer at any time prior to the car's reaching a point not less than three blocks from the place at which the passenger should alight for the purpose of transferring.

"Transfers are valid if presented by person to whom issued at the transfer point indicated upon back of ticket, or one block beyond such a point in the proper direction.

"A transfer is good for passage upon the line canceled or any other line optional to passenger under the right granted by the company's 'special transfer privilege,' if presented within fifteen minutes of the time canceled. It will

also be accepted upon the first car of the line punched passing transfer point after expiration of fifteen minutes later than the time canceled.

"Experience has taught us that passengers frequently board cars of the shorter lines when a car of the longer line is the only one which would have taken them to their destination. For that reason it has been deemed wise, in the best interest of the passengers, to restrict transfers punched for the longer line to that line only."

Results with the Near-Side Car in Chicago

Leonard A. Busby, president of the Chicago (Ill.) City Railway, was quoted as follows on Oct. 6, 1912, in regard to the near-side cars, 100 of which had then been in operation for a month on the lines of the company.

"Reports and personal investigation show that this type of car eliminates 60 per cent of the accidents, gives patrons more seating room and provides the best possible ventilation.

"When the public becomes used to the improved type it will realize that the near-side car is the ideal one. It might also be called accident-proof. Accidents caused by passengers stepping around the rear of a car after alighting and being struck by a car on another track have been eliminated. This is accomplished by having the entrance and exit at the front.

"I have received complaints about passengers not going to the rear of cars after boarding and of cars running by persons on downtown corners. Co-operation is all that is needed to remedy the former complaint. Conductors are instructed to request passengers to step to the rear of the car. As to the second complaint, if a car gets a full load at two or three Loop corners the motorman's instructions are to keep going in order to get out of the congested district. This order is necessary because the cars are operated only sixteen seconds apart in the Wabash Avenue Loop district during the rush hours."

Suggestions to the Safety Committee.—At a recent meeting of the safety committee of employees of the Indianapolis, Columbus & Southern Traction Company, Columbus, Ind., thirty-two suggestions were presented calculated to improve and make the service more efficient.

Near-Side Stops in Birmingham, Ala.—The Birmingham Railway, Light & Power Company, Birmingham, Ala., has announced that, effective on Nov. 1, 1912, its cars will be stopped only on the near side of all streets. A bulletin announcing the proposed change has been posted in the cars of the city.

Reduction in Suburban Fares Out of Rochester.—On Oct. 18, 1912, the Rochester, Syracuse & Eastern Railroad, Syracuse, N. Y., reduced the local one-way cash fares from the Rochester city line (Culver Road) to East Rochester and Stop 11 from 10 cents to 5 cents, and the fare from East Rochester to the Rochester city line (Culver Road), from 10 cents to 5 cents.

Re-routing Cars in Louisville, Ky.—Samuel Riddle, superintendent of traffic of the Louisville (Ky.) Railway, has completed a list of the new routings for cars in Louisville. The re-routing has been necessitated by the completion of the new crosstown car line, which will be put in operation on Nov. 15. The new plan of routing is very comprehensive and embraces a number of changes from the present system. The object of the company is to route all lines as nearly east and west, north and south, as possible without causing confusion.

Interesting Folder on Virginia Peninsula.—The Newport News & Old Point Railway & Electric Company, Hampton, Va., has issued an interesting illustrated folder for tourists and sightseers on the Virginia Peninsula. The company operates between Old Point, Fort Monroe, Hampton Roads, Hampton and Newport News. The folder describes and illustrates many points of historic interest in these places which are referred to in the key numbers on a two-page map printed in the folder. A map of the historical portion of Virginia shows the battlefields and other interesting points and the means of reaching them. The folder was issued under the direction of J. N. Shannahan, general manager of the company.

Changes in Syracuse Car Routes.—B. E. Tilton, general manager of the Syracuse (N. Y.) Rapid Transit Railway, has announced several changes in the routing of cars at the common center in Syracuse. Affected by the re-routing plan are the East Syracuse and Minoa, the Summit, Geddes and Green Street lines. The plan was put in operation at the suggestion of the Public Service Commission of the Second District, following an exhaustive investigation of congested traffic conditions in the eastern section of Syracuse and in East Syracuse. As a partial remedy the company was advised to install a curve at East Fayette and Warren Streets. Two crossings of the New York Central & Hudson River Railroad in Washington Street will be eliminated, thus minimizing danger from accidents.

Auto Traffic Affects Earnings.—At the hearing before the Public Service Commission of the Second District of New York on Oct. 29, 1911, on the application of the Otsego & Herkimer Railroad, Hartwick, N. Y., to make a mortgage for $1,500,000 Louis F. Reed, attorney for the company, referred to the increase in the gross income of the company from $168,000 in 1908 to $230,000 in 1912. Two years ago when representatives of the company were before the commission they estimated that the company's earnings would reach $250,000 in 1912. Explaining the difference between the $230,000 earned in 1912 and the expected earnings of $250,000, Joseph B. Mayer attributed it to loss in travel occasioned by the great increase in the number of automobilists touring through that section of New York State.

Fort Smith Company's Progress.—A special train known as "Arkansas on Wheels" left Little Rock on Oct. 23, 1912, to tour Tennessee, Kentucky, Mississippi, Oklahoma, Florida and Louisiana. The Fort Smith Light & Traction Company, Fort Smith, Ark., has furnished a duplicate set of the photographs contained in the Byllesby uniform photographic record for the exhibit, also several maps showing the company's street railway, electric and gas systems. J. W. Gillette, manager of the company, says: "It is the intention of those in charge of the Fort Smith exhibit to give particular prominence to the work that this company has completed in Fort Smith and the surrounding territory in the last two years and to the splendid service that is rendered by the company to its patrons at all times."

New Jersey Roads Appeal Commuters' Case.—An appeal has been filed in the Court of Errors and Appeals by the Pennsylvania Railroad, the West Jersey & Seashore Railroad, the New Jersey & New York Railroad, the Susquehanna Railroad and the Erie Railroad from the Supreme Court's confirmation of the decision of the State Public Utility Commission that companies within New Jersey must give special rates for commutation between points within the State. The roads have been selling tickets from interior points in the State to New York and Philadelphia and not to the terminal points such as Camden, Hoboken and Jersey City. The railroads contend that at the time of the commission's decision there was no evidence that they were engaged in interstate commerce and they deny that their failure to give special rates within the State operated to the disadvantage of commuters.

Improvements in Philadelphia Surface-Subway System.—The Philadelphia (Pa.) Rapid Transit Company has taken the first step toward increasing the capacity of the surface-subway system. It has installed at the Juniper Street station a system of operating west-bound cars whereby the station platform is divided into berths accommodating four cars, which can be loaded and dispatched simultaneously. Under the present system the capacity of the station is limited to one car at a time. The Juniper Street station has been equipped with an illuminated signal, upon which are listed the names of the surface lines operating in the subway. As the cars approach the platform, the numbers of the berths to be occupied are flashed on the sign opposite the names of the lines. To further facilitate the loading and dispatching of cars, passengers are required to purchase tickets and deposit them in ticket choppers. As a part of the development of the subway-surface system, the company is now operating near-side cars on the subway division of the Darby and Lancaster-Haddington lines, on Route No. 11, now known as the Darby subway line, and on Route No. 10, known as the Lancaster-Haddington subway line.

Personal Mention

Prof. Eric Geisse, until recently professor of the technical school at Brunswick, Germany, has been appointed traffic expert to study the traffic situation in Berlin.

Mr. Ralph N. Sparke, for the past three years engaged in special work for the Bay State Street Railway, Boston, Mass., has been appointed head of the passenger and advertising department to succeed Mr. H. A. Faulkner.

Mr. C. H. Quimby, who has been in charge of several important construction projects in the East for J. G. White & Company, Inc., New York, has been appointed to the Oakland & Antioch Railroad and the Oakland, Antioch & Eastern Railway under Mr. J. L. Crider, who is in charge of construction on these properties.

Mr. J. L. Crider, who has been general superintendent of construction of the Oakland & Antioch Railroad, Oakland, Cal., under construction by J. G. White & Company, Inc., New York, has been placed in general charge of the construction of the Oakland, Antioch & Eastern Railway in addition to his duties with the first-named road.

Mr. Alton W. Leonard has been appointed district manager of the Stone & Webster properties in the Puget Sound district to succeed the late Richard T. Laffin. Mr. Leonard has had charge of Stone & Webster properties in Brockton, Mass., Houghton, Mich., and Minneapolis, Minn. Until recently he was district manager of the properties comprising the Middle West district of the Stone & Webster Management Association.

Mr. C. E. Lenhart, who resigned recently as mechanical engineer in charge of shops and rolling equipment of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, has become connected with the International Motor Company, New York, N. Y., a large manufacturer of auto-trucks for commercial purposes. Mr. Lenhart will be located at the main plant of the company in Allentown, Pa. Mr. Lenhart is well known in the electric railway field, having been engaged in this work since 1888.

Mr. C. L. Sykes, who resigned recently as general passenger agent of the Galveston-Houston Electric Railway, Galveston, Tex., left Galveston on Sept. 21, 1912, for Omaha, Neb., to assume his new duties as secretary and manager of the Omaha Hotel Supply Company. A banquet was tendered to Mr. Sykes at the Bazos Hotel, Houston, on the eve of his departure by his friends and associates, who presented him with a cut-glass lemonade and water set. As previously noted in the Electric Railway Journal, Mr. Sykes will be succeeded with the Galveston-Houston Electric Company by Mr. Frank R. Schneider.

Mr. L. H. Palmer, Jr., has resigned as superintendent of transportation of the New York (N. Y.) Railways to enter other business. Mr. Palmer has held the office which he has just resigned with the New York Railways and its predecessor, the Metropolitan Street Railway, for four and one-half years. He began his connection with the Metropolitan Street Railway in the fall of 1906 when he entered the office of the general manager. He has been an active member of the committee on city rules of the American Electric Railway Transportation & Traffic Association for two years.

Mr. F. H. Hanson has been appointed electrical engineer for the Kansas Public Service Commission, Topeka. Mr. Hanson was graduated from the University of Wisconsin in 1904 and afterward entered the apprenticeship course of the General Electric Company at Schenectady, N. Y. Later he was employed by the Arnold Company, being detailed on the St. Clair Tunnel electrification and other work. He also served in the engineering department of the Railroad Commission of Wisconsin from its establishment by the Legislature in 1907 until his appointment at Topeka. During last summer Mr. Hanson received a leave of absence from the Wisconsin commission to assist Mr. W. J. Hagenah in a valuation study of the Cleveland (Ohio) Electric Illuminating Company's steam and electric plant.

Mr. Herbert A. Faulkner has been elected secretary of the New England Street Railway Club, dating from Nov. 1, 1912, following seven years of noteworthy service as head of the passenger and advertising department of the Bay State Street Railway. He succeeds in his new post Mr. John J. Lane, who has been obliged by continued illness to relinquish active work. Mr. Faulkner is a native of Brockton, Mass., and after receiving a public and high school education in that city he engaged for twelve years in newspaper work, joining the staff of the Boston & Northern Street Railway and the Old Colony Street Railway in 1905. Under his efforts the traffic-stimulating publicity of the Bay State system has atracted national attention and the work of his department has done much to increase the business of all the important electric railways in New England. For some months he has been acting secretary of the New England Street Railway Club. The work of the organization, including the regular club business, the publication of the *Street Railway Bulletin* and other matters, will be conducted as heretofore at 12 Pearl Street, Boston, Mass.

Mr. John Sanders has been appointed general manager of the Danbury & Bethel Street Railway, Danbury, Conn., and has been elected a director of the company. Mr. M. H. Griffing, who has been secretary, treasurer and general manager of the company, continues as secretary and treasurer. Mr. Sanders is a technical graduate in electrical and mechanical engineering and was for several years connected with the railway and the construction engineering departments of the General Electric Company, Schenectady, N. Y. He resigned from the General Electric Company three years ago to become connected with the Ætna Construction Company and the Sperry Engineering Company, New Haven, Conn., in charge of the installation of the power equipment, overhead construction and the rolling stock of the Shore Line Electric Railway, a 1200-volt road out of New Haven. Mr. Sanders was also connected with the New London & East Lyme Street Railway and the Bridgeport & Danbury Street Railway as engineer. He is at present supervising the work of improving the power facilities of the Danbury & Bethel Street Railway, reconstructing the overhead work and rehabilitating the track and rolling stock.

Mr. George A. Gilfillan, who has resigned as acting general manager and consulting engineer of the Morris County Traction Company, Morristown, N. J., will resume his work as consulting engineer with offices in Pittsburgh. Mr. Gilfillan was born in Allegheny County, Pennsylvania, and was educated at the University of Pittsburgh. After spending one year as assistant engineer of the Pittsburgh & Western Railroad he went into street railway work, in which he was one of the pioneers. In 1890 he was engineer in charge of the reconstruction and electrification of the lines of the Pittsburgh & Birmingham Street Railway and he continued as chief engineer of the company until it was merged with the Pittsburgh Railways. In 1896 Mr. Gilfillan opened an office in Pittsburgh as a consulting engineer, in which capacity he served the Pittsburgh, Allegheny & Bellevue Street Railway, the Steubenville Traction Company and the Oakdale & McDonald Street Railway. In the fall of 1909 he became connected with the Morris County Traction Company as consulting engineer and remained in that capacity until the resignation of Mr. H. H. Archer, when he was appointed acting general manager, pending the completion of the construction work which was then under way.

At a meeting of the Nottingham (England) Council the following resolution was proposed: "That the tramways committee be instructed to consider and report to the next meeting of the Council as to the desirability of establishing a car service to Bulwell Hall Park, as a means of improving the communication thereto, especially for the people of the Western Division." The chairman of the tramways committee said he had no objection to the matter coming before his committee again, but before the committee could discuss the question of trackless trams it must know what Parliament was going to do. Eleven cities have bills relating to this question waiting to be dealt with. The proposal was that where trackless trams went beyond a town boundary they should pay two-thirds of the cost of the upkeep of the road. This provision would probably drive the majority of the bills from the House of Commons. A resolution was adopted to await the result of experiments to be conducted with the self-contained petrol-electric bus exhibited at the recent tramway conference at West Ham.

Construction News

Construction News Notes are classified under each heading alphabetically by States.

An asterisk (*) indicates a project not previously reported.

RECENT INCORPORATIONS

***General Railways Company, Wilmington, Del.**—Incorporated in Delaware with a capital stock of $1,000,000. Incorporators: A. M. Leech, M. E. Dorsey, Ferris Giles, all of Wilmington.

***Neuse Transportation & Street Railway, Newbern, N. C.**—Chartered in North Carolina to build an electric railway in Newbern. Capital stock, $100,000. Officers: A. T. Dill, president; W. C. Willett, vice-president; B. Craven, treasurer. Others interested are Clyde Eby and A. T. Dill.

***Ardmore & Waurika Railway, Ardmore, Okla.**—Incorporated in Oklahoma to build a 50-mile railway from Ardmore to Waurika. Headquarters, Ardmore. Capital stock, $10,000. Incorporators: Dorset Carter, F. Hand, L. T. Cook and J. W. Williams, Purcell, Okla., and R. C. Boles, Chickasha, Okla.

***Mountain Railway, St. Elmo, Tenn.**—Application for a charter has been made in Tennessee by this company to build an electric railway in St. Elmo. Incorporators: W. E. Boileau, general manager of the Chattanooga Railways; E. D. Reed, T. G. Newman, D. S. Hahn and Joseph E. Brown.

***Lufkin, Hemphill & Gulf Railway, Hemphill, Tex.**—Incorporated in Texas to build an interurban railway from Kindred to Godwin's Ferry on the Sabine River, a distance of 36 miles. Capital stock, $100,000. Incorporators: Hiram Knox, G. E. Pratt, J. O. Toole, Hemphill; C. B. Collins, Lufkin; W. M. Cady, B. E. Smith, McNary, La.; Robert Stack, Woodworth, La.; F. J. Bernhardt, Keenan, Tex.; Arch MacDonald, Houston.

***Port Arthur Light & Power Company, Port Arthur, Tex.**—Incorporated in Texas to take over the light and power plant of the Port Arthur Traction Company. Capital stock, $600,000. The incorporators are: Elwin J. Emerson, Beaumont; Walter N. Monroe, Port Arthur; Charles W. Kellogg, Jr., Dallas. Other stockholders are: Raymond Neilson, Jesse Andrews, C. R. Wharton, W. H. Walne, C. L. Carter, all of Houston.

FRANCHISES

Birmingham, Ala.—The City Commission has been asked to consider two propositions for a franchise for an electric railway in Birmingham along Avenue F from Twentieth Street west to the Montevallo Road, one being the offer of the Kelly company and the other made by W. P. G. Harding and associates.

Bentonville, Ark.—The Arkansas Northwestern Railroad has asked the City Council for a franchise to build a line through Bentonville from north to south, a distance of nearly 2 miles. This company plans to build through Bentonville from east to west and connect with Rogers, Cave Spring and Springtown. H. L. Cross, Bentonville, secretary.

***Los Angeles, Cal.**—Henry M. Dennison, Los Angeles, has received a twenty-one-year franchise from the City Council to build an electric railway on Main Street from Slauson to Manchester Avenue.

San Francisco, Cal.—The Geary Street Municipal Railway has received permission from the Board of Supervisors to build down Market Street to the ferry in San Francisco.

San Francisco, Cal.—The Sutter Street Railway has received a franchise from the Board of Supervisors to build on Market Street from Sansome Street to the city front of San Francisco.

***San Rafael, Cal.**—S. J. Norton, San Rafael, has asked the Board of Supervisors for a franchise to build an electric railway from San Anselmo to Fairfax.

***Pocatello, Idaho.**—James H. Brady, Lyman Fargo and W. F. Kasiska have asked the Council for a franchise to build an electric railway through the eastern and western portions of Pocatello.

Galesburg, Ill.—The Rock Island Southern Railway and the Burlington Railroad entered into an agreement whereby the former is to enter Galesburg over the tracks of the latter. The Rock Island Southern Railway has filed a petition with the City Council for permission to build lines on Accommodation Avenue, Railroad, Henderson, Holton, Fourth and Abingdon Streets in Galesburg.

Springfield, Ill.—Isaac A. Smith, representing the Springfield & Central Illinois Traction Company, has notified the City Commission that he will ask for an independent franchise for an interurban line to be run from St. Louis to Springfield by way of Hillsboro and Pawnee. This line will connect Springfield, Pawnee, Hillsboro, Durley, Carlyle, Hoffman and Centralia. [E. R. J., June 8, '12.]

Newcastle, Ind.—The Indiana Union Traction Company, Anderson, has received a franchise from the Council to enter Newcastle from the north over Twelfth Street.

Dubuque, Ia.—The Union Electric Company, Dubuque, has asked the Council for a franchise to extend its line up West Locust Street in Dubuque.

Abbeville, La.—The Louisiana Electric Railway & Power Company, Lafayette, has asked the Council for a franchise in Abbeville. It will connect New Iberia, Abbeville and Lafayette. A. G. Barrow, New Iberia, president. [E. R. J., Sept. 28, '12.]

Newburyport, Mass.—The Citizens' Electric Street Railway has asked the State Board of Railroad Commissioners for a franchise for an extension in Pleasant, Titcomb and Winter Streets in Newburyport.

Springfield, Mass.—The Springfield Street Railway has asked the Board of Aldermen for a franchise to use the side of the street near Lincoln Park, Chicopee Falls, for a double track line on the Liberty Street line in Springfield.

Kalamazoo, Mich.—The Michigan United Traction Company has asked the Council for a franchise to make several improvements and extensions to its lines in Kalamazoo.

Buffalo, N. Y.—The Board of Aldermen have approved the report of the streets committee granting the application of the International Railway to double-track Seneca Street to connect the Hoyt and Seneca lines and permit the company to put in a Y switch in Sycamore Street and Koons Avenue in Buffalo.

New York, N. Y.—The Public Service Commission has granted the application of the Dry Dock, East Broadway & Battery Railroad for permission to electrify its surface lines on Canal Street between the east side of the Bowery and the west side of Centre Street in New York City. This line has heretofore been operated by storage battery cars.

***Portland, Ore.**—George F. Heusner, Portland, has asked for a franchise from the Council to build an electric railway from Kilpatrick Street, in Kenton, south over Patton, across the Broadway bridge and up Seventh Street in Portland.

***Follansbee, Pa.**—Plans are being prepared to ask the City Council for a franchise in Follansbee. This is part of a plan to build an electric railway from Pittsburgh to Follansbee, via Eldersville.

Pittsburgh, Pa.—The City Council's Public Service Committee has approved the ordinance making a special agreement between the city, the Pittsburgh Railways Company and the Panhandle Traction Company to use Corliss Street in Pittsburgh for an electric railway.

St. Elmo, Tenn.—The Chattanooga Railway & Light Company has received a franchise from the Council in St. Elmo. This line will be the connecting link between the main line and the extension up Lookout Mountain.

Lockhart, Tex.—W. B. Dunlap, Beaumont; J. W. Crawford and F. W. Brown, Orange; J. W. Maxey, Houston, and J. M. Abbott, Seguin, representing the promoters of an interurban line from Houston to Lockhart, Seguin, New Braunfels and San Antonio, have received a franchise from the County Commissioners and City Council for the route through Caldwell County and in Lockhart. [E. R. J., Oct. 19, '12.]

Salt Lake City, Utah.—The Utah Interurban Electric Company has received a fifty-year franchise from the County Commissioners through Salt Lake County from the southern limits of Salt Lake City. The company has

also received a franchise in Lehi. W. W. Armstrong is interested. [E. R. J., Oct. 26, '12.]

Seattle, Wash.—The City Council has authorized the Board of Public Works to proceed with the construction of a portion of the municipal railway in Seattle and appropriated $300,000 therefor. H. R. Dimock, Seattle, city engineer. [E. R. J., July 13, '12.]

Fulton, W. Va.—The West Virginia Traction & Electric Company, Wheeling, has asked the Council for a fifty-year franchise in Fulton.

Elkhorn, Wis.—The Badger Railway & Light Company has received a franchise from the Council in Elkhorn.

TRACK AND ROADWAY

Birmingham & Chattanooga Railroad, Birmingham, Ala.—Surveys have been completed and construction will soon be begun by this company on its 147-mile electric railway between Birmingham, Ala., and Chattanooga, Tenn. J. M. Spradin, Boaz, president. [E. R. J., Sept. 21, '12.]

Edmonton (Alta.) Radial Railway.—During the winter this company will award contracts to build 11 miles of paved track and 9 miles of ballasted track in Edmonton.

***Medicine Hat, Alta.**—It is said that representatives of certain English bankers have prepared a report on a proposed electric railway to operate in Medicine Hat and other industrial undertakings calling for the investment of about $600,000.

***Fort Smith, Arkoma & Wilburton Railway, Fort Smith, Ark.**—This company plans to begin construction at once in Arkoma. The contract has been awarded for building the line from a connection with the switch near the brick plant in Arkoma to a point about ½ mile south of the southern limits of Arkoma. The contract for the remainder of the line to Wilburton will be let about Jan. 1. This railway will connect Fort Smith, Arkoma and Wilburton.

Helena Street & Interurban Railroad, Helena, Ark.—Surveys have been begun by this company on its extension from Helena to West Helena and to Marianna. This company recently purchased the light and power plant at Marianna.

***Sulphur Springs, Ark.**—H. Hanf and A. G. Russell propose to build an electric railway between Sulphur Springs and Pine Bluff.

British Columbia Electric Railway, Vancouver, B. C.—This company has placed in operation its line in Point Grey. This is known as the Wilson Road line, and extends on that street from the Kerrisdale station to a mile west, terminating at Dunbar Street.

Pacific Electric Railway, Los Angeles, Cal.—This company plans to build a new line in Glendale to tap the Verdugo Canyon property. Practically all the right-of-way for this new line has been secured, though three different routes are being considered by the company. It is announced that the company will build a double-track line into San Francisco from Palo Alto and thus establish a fast connecting link with all suburbs between San Francisco and San José.

Oakland, Antioch & Eastern Railway, Oakland, Cal.—The War Department has sanctioned the building of the suggested steel bridge planned by this company across the Suisun Bay near Pittsburgh, Cal. With this bridge it will be possible for trains to reach Oakland from Sacramento within two hours.

Northern Electric Railway, San Francisco, Cal.—Plans are being made by this company to extend its lines to the northwestern portion of Marysville, a distance of about 8 miles.

***Tulare, Cal.**—Plans are being made by Lindsay capitalists to build an electric railway which would extend north from Porterville to Lindsay and thence to Tulare.

Sacramento Valley West Side Electric Railway, Willows, Cal.—Construction will soon be begun by this company down the west side of the Sacramento Valley. The line will extend from Red Bluff on the Sacramento River to a point about 6 miles southeast of Dixon, connecting with the Oakland, Antioch & Eastern Electric Railway, which will run from Oakland to Sacramento. The line will cross the Vallejo & Northern Railway, and will connect at Woodland with the Sacramento & Woodland Railway. A branch will be run from Williams to Colusa, where connection will again be made with the Northern Electric Railway on its Marysville and Colusa branch. C. L. Donohue, Willows, president. [E. R. J., Oct. 19, '12.]

Shore Line Electric Railway, Saybrook, Conn.—This company is now building 1 mile of track from main line in Saybrook to the Connecticut River bridge to connect with the tracks of New London & East Lyme Street Railway.

Waterbury & Milldale Tramway, Waterbury, Conn.—This company has awarded a contract to the Fred T. Ley Company for the construction of its line from Waterbury to Milldale. It is stated that arrangements have been made between the company and the Connecticut Company by which passengers can be transferred at Milldale and the Waterbury & Milldale company can operate its cars over the Connecticut Company's tracks into Exchange Place in Waterbury. Charles H. Clark, Milldale, president. [E. R. J., Oct. 19, '12.]

St. Johns Electric Company, St. Augustine, Fla.—This company has completed all preliminary plans and will begin construction at once on the extension from St. Augustine to New Augustine.

***Carrollton, Ga.**—H. G. Lowry, Carrollton, and associates plan to build an electric railway between Carrollton and Atlanta.

Indiana Union Traction Company, Anderson, Ind.—This company has secured the entire right-of-way for its line between Newcastle and Muncie. The contract for the construction of the grade was awarded to the Fisher Welsh Construction Company, Indianapolis.

Indianapolis Traction & Terminal Company, Indianapolis, Ind.—Within a short time this company expects to begin running its cars in East Washington Street from Audubon Road to Sheridan Avenue. The company is building a Y and necessary switches.

***Laporte, Ind.**—Steps have been taken by Ora Boserman and other representatives of the Murdock traction interests for the construction of an interurban line from Laporte south to Union Center, through to Knox and Bass Lake in Starke County.

Northern Indiana Railway, South Bend, Ind.—Plans are being considered by this company for the construction of a line from La Porte to Knox via Bass Lake.

Danville (Ky.) Electric Company.—It has been announced that within a short time this company will begin the construction of an electric railway between Danville and Perryville. Later a line will be built to Junction City, where it will connect with the Louisville & Nashville Railroad.

Algiers Railway & Lighting Company, Algiers, La.—This company has placed in operation its new line to the immigration station in Algiers.

Portland (Maine) Railroad.—Work has been begun by this company relaying rails on Middle Street and removing turnouts on several streets in Portland.

Berkshire Street Railway, Pittsfield, Mass.—This company has been asked to consider plans to build a line from Great Barrington to Chatham through the Green River Valley.

Springfield, (Mass.) Street Railway.—This company has placed in operation its East Springfield line, and the cars now run as far as the Boston & Albany Railroad bridge. The company plans to build at once a new bridge over the Boston & Albany Railroad tracks.

Compañia de Tranvias de Nuevo Laredo, S. A., Nuevo Laredo, Mex.—During the next three months this company will award contracts to build 1¼ miles of track. This extension is to form a belt line in Nuevo Laredo.

***Lexington, Mich.**—David Oppenheim, Detroit, and William C. Clark have presented plans to the Council for the construction of an electric railway to connect Romeo, Almont, Imlay City, Capac, Emmet, Yale, Speaker, Peck, Buell, Croswell and Lexington, a distance of 55 miles. The power house would be located at Lexington.

Atlantic Coast Electric Railway, Asbury Park, N. J.—This company has received permission to build across the State camp grounds at Sea Girt. The line now terminates

in Sea Girt, but when the tracks are built across the camp grounds it will permit the company to have a line which will connect Point Pleasant, Manasquan and Bay Head with the other coast resorts which are tapped by the lines of this railway.

Fargo & Moorhead Street Railway, Fargo, N. D.—Plans are being considered by this company for an extension between Fargo and the Detroit Lake district of Minnesota. The company plans to place in operation soon its new line to Dilworth.

Toledo & Indiana Traction Company, Toledo, Ohio.—This company has been asked to consider plans for a proposed extension from Bryan to Montpelier.

Ottawa, Rideau Valley & Kingston Railway, Ottawa, Ont.—U. L. Upson, general manager of this company, has succeeded in making the complete survey maps and profiles and in financing this proposed 127 miles to connect Ottawa, Smith's Falls, Lanark and Kingston. It is stated that this line will be operated by steam. [E. R. J., July 20, '12.]

Niagara, St. Catharines & Toronto Railway, St. Catharines, Ont.—This company has secured the right-of-way on its line to Niagara-on-the-Lake. The company is waiting the sanction of the railway board to cross the Grand Trunk Railroad yards.

Multnomah Central Railway, Portland, Ore.—Construction of this line from Cottrell, on the Mount Hood line of the Portland Railway, Light & Power Company, to Sandy, a distance of 6 miles, will be continued through the winter with the intention of having the line in operation by spring. The line is surveyed beyond Government Camp to Mount Hood. A pass through the mountains would permit its extension into the Warm Springs Indiana Reservation and the Upper Deschutes Valley. Traffic arrangements have been made with the Portland Railway, Light & Power Company for handling passengers and freight between points on the new line and Portland. W. J. Conday, Chicago, secretary. [E. R. J., May 25, '12.]

Portland Railway, Light & Power Company, Portland, Ore.—Announcement has been made by this company that work will be begun at once on an extension on Maryland Avenue for over a mile. Application will be made soon to the City Council for a franchise to extend this line on Prescott Street to Patton Avenue and thence northerly on Patton Avenue to Pippin Street.

Warren (Pa.) Street Railway.—This company has secured all right-of-way for its projected line from Warren to Youngsville.

Charleston Consolidated Railway & Lighting Company, Charleston, S. C.—It is reported that James Sottile has purchased the seashore division of this company and that an extension will be built from Mount Pleasant to McClellanville, a distance of 40 miles.

Memphis (Tenn.) Street Railway.—Plans are being considered by this company to build an extension of the Florida Avenue South Memphis line to Riverside Park in Memphis.

Eastern Texas Traction Company, Dallas, Tex.—Construction material has been ordered by this company for the construction of its line between Greenville and Dallas. J. F. Nichols, Greenville, president. [E. R. J., Sept. 21, '12.]

Southern Traction Company, Dallas, Tex.—Construction has begun on this company's bridge across the Brazos River at Waco. Pierson & Company, of Houston, have the contract.

Houston (Tex.) Electric Railway.—This company will soon begin work on its new line which is to extend through and over Avenue M in Magnolia Park to a point near the turning basin and the International & Great Northern wharf.

***Lewiston & Northern Railway, Ogden, Utah.**—P. A. Wells, promoter of the line from Ogden to Logan, has completed the surveys of the proposed route through Ogden Canyon, via Eden and Liberty, over the divide to Cache Valley to the Temple City.

Salt Lake & Utah Railroad, Salt Lake City, Utah.—Construction has been begun by this company in Provo. This line will connect Salt Lake City, Provo and Payson. [E. R. J., Oct. 26, '12.]

Chippewa Valley Railway, Light & Power Company, Eau Claire, Wis.—This company plans to build in the spring about 6000 ft. of new track.

SHOPS AND BUILDINGS

Edmonton (Alta.) Radial Railway.—During the winter this company will award contracts to build an extension to its North Side carhouse and build new South Side carhouses in Edmonton.

Washington, Baltimore & Annapolis Electric Railway, Baltimore, Md.—During the next few weeks this company will award contracts to build a new freight terminal on the property known as 320, 322, 324 and 326 West Pratt Street in Baltimore. The company plans to have this building completed before the coming spring.

Boston (Mass.) Elevated Railway.—This company has opened a new subway station at the Harvard Stadium on the Cambridge side of the Charles River on Boylston Street, Cambridge. The structure consists of a concrete platform, 350 ft. x 15 ft., with ticket offices and accommodating five-car trains, if needed.

Richmond & Rappahannock River Railway, Richmond, Va.—This company has awarded contracts and work will be begun at once on its new terminal building to be erected near Twenty-ninth Street and P Street in Richmond. The structure will be two stories, 39 ft. x 115 ft. and of brick and concrete construction. The cost is estimated at $15,000.

Milwaukee Western Electric Railway, Milwaukee, Wis.—This company expects to build two or three new substations during 1913.

POWER HOUSES AND SUBSTATIONS

Edmonton (Alta.) Radial Railway.—During the winter this company expects to purchase two new 500-kw generators.

San Diego (Cal.) Electric Railway.—This company has placed an order with the Westinghouse Machine Company for one 5000-kva, three-phase, 60-cycle, 2400-volt turbo-generator set with 50-kw, 125-volt, direct-connected exciter for its power house in San Diego.

Minneapolis (Minn.) Street Railway.—This company has purchased one 1500-kw turbine from the General Electric Company.

Laconia (N. H.) Street Railway.—This company has made arrangements to receive its power from the Laconia Gas & Electric Company at East Tilton.

Fargo & Moorhead Street Railway, Fargo, N. D.—This company has begun the erection of the switchboard panel for the new turbo-generator set at Fargo. A 400-ft. primary extension was made to supply service to two large buildings of the Oak Grove Seminary, and a 2½-kw transformer was installed.

Tri-State Railway & Electric Company, East Liverpool, Ohio.—This company has placed an order with the Westinghouse Electric & Manufacturing Company for one 4000-kva, 2400-volt, two-phase, 60-cycle turbo-generator together with one 100-kw direct-current turbo-generator and one 300-kw, 600-volt, 60-cycle rotary converter, two 150-kva, 2200-volt rotary converters, a 60-cycle O.I.S.C. transformer, one switchboard and control apparatus for the above equipment.

Philadelphia Rapid Transit Company, Philadelphia, Pa.—This company has placed with the Westinghouse Machine Company an order for one 100-kw, 125-volt, d. c. compound-wound turbo-generator set.

Pittsburgh (Pa.) Railways.—This company has placed an order with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, for two 1000-kw, two-bearing 514-r.p.m. motor-generator sets, consisting of one 1000-kw 550-volt compound-wound direct-current generator and one 1440-hp, three-phase, 60-cycle, 10,000-volt synchronous motor; also three 250-kva, 60-cycle, 22,000/376 O.I.S.C. transformers and complete switchboards for four substations, together with auxiliary apparatus for this equipment.

Stroudsburg (Pa.) Passenger Railway.—This company is now building a new power house in Stroudsburg.

Milwaukee Western Electric Railway, Milwaukee, Wis.—This company is now doing grading work and expects to build 74 miles of track in 1913.

Manufactures and Supplies

ROLLING STOCK

Edmonton (Alta.) Radial Railway has ordered one Simplex dump car from the Canadian Car & Foundry Company.

Citizens' Railway & Light Company, Muscatine, Ia., has ordered eight 20-ft. 1-in. closed pay-as-you-enter cars mounted on Brill 21-E trucks from the American Car Company.

British Columbia Electric Railway, Vancouver, B. C., has ordered from the Westinghouse Electric & Manufacturing Company five 50-ton locomotives to be equipped with four No. 308 B-3 motors and HB control.

New York State Railways, Rochester, N. Y., noted in the Electric Railway Journal of Aug. 24, 1912, as having ordered twenty single-end pay-as-you-enter cars from The J. G. Brill Company, has specified the following details for this equipment:

Weight (car body only), 18,000 lb.	Couplers ..... Brill
Bolster centers, length, 22 ft. 3 in.	Curtain fixtures..Cur. S. Co.
Length of body ..30 ft. 11 in.	Curtain material..Pantasote
Length over vestibule, 43 ft. 6 in.	Gongs .....Brill
Width over sills....8 ft. 3 in.	Hand brakes ..... Brill
Width over all...8 ft. 5¼ in.	Heaters ..... Smith
Height, rail to sills, 2 ft. 7 5/16 in.	Headlights ..... Dayton
Body ..... wood	Journal boxes ...Symington
Interior trim ..... cherry	Motors .....West. 307-C
Headlining ..... Agasote	Motors .....outside-hung
Roof ..... plain arch	Paint ..... Lowe
Underframe ..... metal	Sash fixtures ..... Brill
Bumpers ..... Brill	Seats ..... H. & K.
Cables ..... West.	Seating material ..... cane
Car trimmings ..... Brill	Springs ..... Brill
Conduits and junction boxes, Brill	Step treads ..... Mason
	Trucks .....Brill 39-E
	Varnish ..... B. & C.
	Ventilators ..... Brill
	Wheels ..... Nat.

TRADE NOTES

Perry Ventilator Corporation, New Bedford, Mass., has received an order for ventilators to equip the twenty all-steel cars now being built by the Laconia Car Company for the Boston (Mass.) Elevated Railway.

W. N. Smith, Yonkers, N. Y., consulting engineer, who recently completed his engagement as designer of the new electrical equipment of the Washington & Old Dominion Railroad, has been retained by the Pittsburgh Construction & Supply Company, Washington, D. C., to prepare plans and specifications for about 10½ miles of catenary trolley construction and rail bonding and the equipment of a substation, which the above company is providing for the Washington & Great Falls Railway, now being built between Chevy Chase and Great Falls, Md.

General Fire Extinguisher Company, Providence, R. I., is giving an interesting demonstration of automatic sprinklers in operation at the Water Conservation Exhibit in the courtyard of the Philadelphia City Hall. A house of wired glass with steel framework has been erected. At the center of the ceiling is a Grinnell automatic sprinkler connected by piping through the necessary valves and from there to the city water supply. Underneath this sprinkler a conical structure covered with an asbestos fiber is periodically saturated with alcohol and lighted. After fifteen seconds the sprinkler head fuses, releasing the water and extinguishing the fire.

General Electric Company, Schenectady, N. Y., is completing fourteen gas-electric cars at its Erie (Pa.) shops. Among these are cars for the Missouri & North Kansas Railroad, Texas Midland Railroad, Pittsburgh & Lake Erie Railroad, Rock Island Company and the St. Louis & San Francisco Railroad. One of the most significant tendencies in connection with the introduction of these units is exemplified in the fact that 40 per cent of the roads on which they are operated have subsequently installed additional cars. One of the largest users of gas-electric cars is the St. Louis & San Francisco Railroad, which now has seventeen cars of this type operating regularly on its branch lines.

George H. Anger, Preston, England, reports orders for the Anger improved automatic brake adjuster from New Zealand, Australia, China, Japan, South Africa, South America, India and Ceylon, as well as from England for Portsmouth, Bournemouth, Pentypridd, Hastings, Cardiff and many other places, and that it already is in use now at the following places: Preston, Blackpool, Birmingham, Wolverhampton, Rawtenstall, Carlisle, New Castle-on-Tyne, Nelson, Wallasea, Walsall, Salford, Bolton and Oldham. The adjuster has just been examined by the English Board of Trade and has been reported favorably. The manufacturer has received letters from some of the best known tramway engineers in England indorsing the device.

Crocker-Wheeler Company, Ampere, N. J., has recently installed two 25-cycle, 4500-kva, three-phase core-type, butt-joint, water-cooled transformers at the Superior transformer station of the Great Northern Power Company. These transformers were put to a sudden and severe test just a few hours after they were ready to be put into regular service. On one of the towers of the transmission line running to the Duluth transformer station which is tied in with the Superior station the six installations were shot to pieces by rifle bullets, thereby putting out of service the transformers in this station. As this occurred just at the beginning of the peak-load period the two Crocker-Wheeler transformers at Superior had to carry upward of 6000 kw apiece until the damaged lines had been repaired and normal service restored.

Griffin Wheel Company, Chicago, Ill., is undergoing reorganization. The new company will be incorporated under the laws of Massachusetts with $12,000,000 authorized common stock, of which $9,500,000 will be issued, and $9,000,000 authorized 6 per cent cumulative preferred stock, of which $6,000,000 will be issued. The new preferred will be retirable as a whole at $115 a share or in part at $120 a share. Present holders of preferred are to receive $110 cash with the privilege of subscribing at par for the new preferred up to 110 per cent of their present holdings. The holders of the present common stock are to receive one and four-fifths shares of new common and forty-five hundredths of a share of new preferred. The reorganized company is to deliver to trustees $3,300,000 cash to be paid to depositors of the old preferred shares. Approximately $500,000 will be expended for additions and betterments now under way and for working capital.

ADVERTISING LITERATURE

Naugle Pole & Tie Company, Chicago, Ill., has issued a folder which calls attention to the large stock of poles it has on hand for immediate shipment.

MacGovern & Company, New York, N. Y., have issued their catalog for October, 1912, covering electrical and steam machinery, cars, car equipments, etc.

Electric Storage Battery Company, Philadelphia, Pa., has issued Bulletin No. 137, entitled "Some Recent Developments in the Lead Battery for Electric Vehicles."

Standard Underground Cable Company of Canada, Ltd., Hamilton, Ont., has printed a sixteen-page booklet which discusses the merits of Sterling rubber insulated wire and cable.

Railway & Industrial Engineering Company, Pittsburgh, Pa., has issued Bulletin No. 8, which describes and illustrates Burke high voltage air-brake switches, improved horn-type lightning arresters and horn-type fuses.

Ideal Case-Hardening Compound Company, New York, N. Y., has issued the fourth edition of its booklet entitled "Case Hardening, Pack Hardening, Annealing of Steel." It contains much useful information and practical rules in connection with this subject.

Consolidated Car Fender Company, Providence, R. I., has issued a sixteen-page catalog entitled "Fending Life and Limb." It is divided into two sections, the first being of interest to the executive and claim departments and the second to the construction and maintenance departments. The catalog illustrates and describes in detail the Providence fender, the H-B life guard, the Providence life guard and the Campbell snow sweeper.

BRILL CITY AND INTERURBAN CARS AND TRUCKS BRILL

One-Man Operation

There isn't much chance for arguments against the desirability of one-man operation where traffic conditions permit.

The illustration above shows a Brill-built one-man pre-payment car designed by the Nearside Car Company for the International Railway Company which is now putting these cars into service at Lockport, N. Y.

Other Brill-built cars for one-man operation have during the past two years been operated in Brunswick, Ga., Missoula, Mont., Muskogee, Okla., Waco, Tex., Selma, Ala., Freeport, Ill., Hutchinson, Kan., and Waycross, Ga.

As an indication of the part which one-man operation has accomplished in the development of street railroading, it is interesting to recall that the old bob-tail horse car saved many roads from financial embarrassment. Cutting platform expenses in two made it easier to interest capital. The present activity in developing more economical and efficient types of cars also indicate that it would probably pay many roads to consider one-man pre-payment operation.

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Springfield, ... Mass.

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Cleveland, ... Ohio

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Paris, ... France

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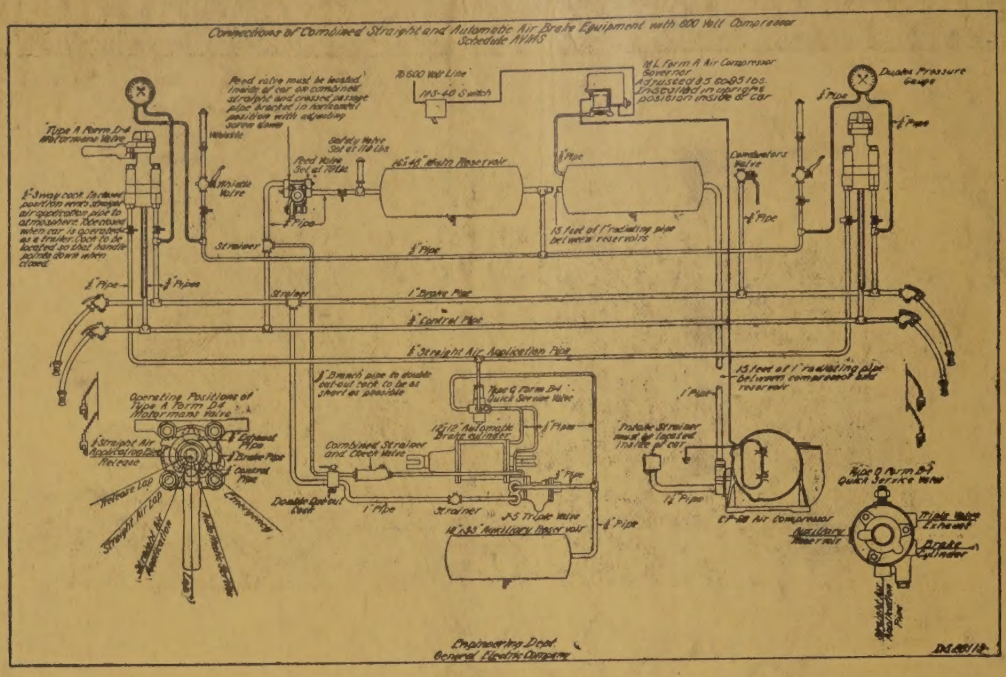
Connections of Combined Straight and Automatic Air Brake Equipment with 600 Volt Compressor
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General Electric Company

Operated by One Motorman's Valve Handle The G-E Combined Straight and Automatic Air Brake Equipment

Provides for straight air application of the brakes on motor cars operating as single units.

Provides automatic variable release operation for trains not exceeding five cars.

In emergency, air is admitted to the brake cylinder on the head car by both the automatic and straight air features of the equipment, giving a maximum brake cylinder pressure that can be maintained against leakage.

When operating in trains, the brake cylinder pressure on the head car may be built up by the straight air feature of this equipment, thus providing additional means for making a smooth and accurate stop.

The change from straight air to automatic operation, or vice versa, may be made at the will of the operator, by moving the motorman's valve handle to different positions on the valve quadrant. (See drawing above.)

For interurban service and for motor cars which do switching or handle steam railroad cars, the combined features of this equipment produce maximum reliability and flexibility of operation.

General Electric Company

Largest Electrical Manufacturer in the World

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For Texas and Oklahoma business refer to General Electric Company of Texas,—Dallas, El Paso, Houston and Oklahoma City
For Canadian business refer to Canadian General Electric Company, Lt'd, Toronto, Ont.

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